3.1.13.2 Clark County

In 2000, the minority population of Clark County was about 548,000 persons, or 40 percent of the *total population* (DIRS 156909-Bureau of the Census 2001, p. 3 of Table DP-1; Clark County). In 1990, a total of about 80,000 residents, or 11 percent of the Clark County population, was characterized as living in poverty (DIRS 103123-Bureau of the Census 1992, Table P117).

3.1.13.3 Lincoln County

In 2000, the Lincoln County minority population consisted of about 450 persons, or 10 percent of the population (DIRS 156909-Bureau of the Census 2001, p. 10 of Table DP-1; Lincoln County). In 1990, 500 persons, or 14 percent of the population, were characterized as living in poverty (DIRS 103127-Bureau of the Census 1992, Table P117).

3.1.13.4 Nye County

In 2000, the Nye County minority population was about 5,000 persons, or 15 percent of the population (DIRS 156909-Bureau of the Census 2001, p. 13 of Table DP-1; Nye County). In 1990, there were 2,000 persons, or 11 percent of the population, characterized as living in poverty (DIRS 103131-Bureau of the Census 1992, Table P117).

3.1.13.5 Inyo County, California

One block group with a low-income population located in the area of the Stewart Valley in Inyo County, California, lies partly within the 80-kilometer (50-mile) air quality region of influence for the repository (Figure 3-25). DOE performed additional review, including a ground survey, and concluded that low-income persons living in the block group would be likely to live outside the 80-kilometer region of influence for the repository.

3.2 Affected Environment Related to Transportation

This section describes the existing (or baseline) environmental conditions along the candidate rail corridors and truck (legal-weight and heavy-haul) routes to the Yucca Mountain site. The EIS treats these corridors and routes as current analytical tools and refers to them in the present tense. The EIS refers to impacts associated with these alternatives in the conditional voice (would) because they would not occur unless DOE proceeded with the Proposed Action. This convention is applied whenever the EIS discusses the transportation implementing alternatives.

DOE has made revisions to this section since the publication of the Draft EIS to present newly acquired information that contributes to an improved (or updated) understanding of the potentially affected environment, to address more specifically the affected environment along the rail corridor variations in Nevada, and to include information and suggestions for improvement provided through public comment on the Draft EIS and the Supplement to the Draft EIS. The more significant changes occur in the Nevada Transportation section (Section 3.2.2) and particularly in the discussion of candidate rail corridors (Section 3.2.2.1). Key changes to the Final EIS that deal with affected environment for transportation are summarized in the following:

- Incorporated updates to the land use discussions based on actions since the Draft EIS, including land transfers to the Timbisha Shoshone Tribe for establishment of new reservation; and to Clark County for the development of the Ivanpah Valley Airport and the Apex Industrial Park.

- Improved descriptions of land use and aesthetics as a result of the collection of additional information, including perspectives gained from a ground survey of the potential rail corridors.

- Expanded hydrology discussions, primarily by reference to Appendix L, to include results of an effort to compile information on 100-year flood zones along the rail corridors and their variations.

- Augmented the biological resources discussion for potential Nevada rail corridors to biological resources and soils by adding a new soils section to describe several pertinent soil characteristics and their presence along the rail corridors and their variations.

- Expanded cultural resources discussions to incorporate results of an effort to collect and evaluate additional baseline data for the Nevada Transportation for the rail corridors and the heavy-haul truck routes.

- Updated baseline socioeconomic data to incorporate information from the 2000 Census and, as appropriate, information from the State Demographer and local government agencies.

- Expanded the noise discussion to address background levels of ground vibration along both the rail corridors and the heavy-haul truck routes.

- Updated and refined the environmental justice methodology described for candidate rail corridors, including the incorporation of more detailed maps (in Appendix J) of minority populations.

- Expanded information presented in the land use, hydrology (surface-water and groundwater), biological resources, and cultural resources discussions to address more specifically applicable variations to each of the rail corridors.

3.2.1 NATIONAL TRANSPORTATION

The loading and shipping of spent nuclear fuel and high-level radioactive waste would occur at 72 commercial and 5 DOE sites in 37 states. Transport of these materials to the Yucca Mountain site could involve trains, legal-weight trucks, heavy-haul trucks, and barges; the trains and trucks would travel on the Nation's railroads and highways. This includes existing railroads and highways in Nevada up to a point of departure to specific Nevada routes described in Section 3.2.2. Barges and heavy-haul trucks would be used for short-distance transport of spent nuclear fuel from storage sites to nearby railheads. (Heavy-haul trucks could also be used for Nevada transportation, as discussed in Section 3.2.2.2.)

The national transportation of spent nuclear fuel and high-level radioactive waste (including transportation in Nevada to a point of departure to a specific Nevada transportation route) would use existing highways and railroads and would represent a small fraction of the existing national highway and railroad traffic [less than 1 percent (0.006 percent) of truck miles per year or 0.007 percent of railcar miles per year (DIRS 150989-BTS 1998, p. 6)]. Because no new land acquisition and construction would be required to accommodate these shipments, this EIS focuses on potential impacts to human health and safety and the potential for accidents along the shipment routes.

The region of influence for public health and safety along existing transportation routes is 800 meters (0.5 mile) from the centerline of the transportation rights-of-way and from the boundary of railyards for incident-free (nonaccident) conditions. The region of influence extends to 80 kilometers (50 miles) to address potential human health and safety impacts from accident scenarios.

DOE used HIGHWAY (DIRS 104780-Johnson et al. 1993, all) and INTERLINE (DIRS 104781-Johnson et al. 1993, all) computer models to derive representative highway and rail routes, respectively, for

shipping spent nuclear fuel and high-level radioactive waste. In addition to identifying routes that were used in the analysis, these models were used to estimate population densities along routes in states other than Nevada based on the 1990 Census. The HIGHWAY model identified highway routes between the commercial and DOE generator sites and the proposed repository that would meet the requirements of U.S. Department of Transportation regulations; there are no corresponding Federal regulations that constrain the routing of rail shipments. The analysis used population densities along the highway and rail routes to estimate human health impacts and consequences of transportation. Except in Nevada, the analysis accounted for growth in populations along routes by increasing impacts based on Bureau of the Census forecasts of state populations in 2025, population reported by the 2000 Census for each state, and extrapolation of population growth along routes to 2035. For routes in Nevada, DOE used a Geographic Information System and 1990 census data to develop an initial estimate of the populations within 800 meters (0.5 mile) along highways, commercial rail lines, and the potential corridors for a proposed branch rail line. The analysis of health and safety impacts accounted for growth in populations along Nevada routes by increasing impacts based on forecasts of population growth in Nevada counties using the REMI computer program. The analysis using the REMI program used population growth forecasts provided by Clark County, Nye County, and the State of Demographer and census data for each county provided by the 2000 Census to estimate populations in Nevada in 2035.

3.2.1.1 Highway Transportation

USE OF REPRESENTATIVE ROUTES IN IMPACT ANALYSIS

At this time, prior to approval of the site for development and operation of a repository and years prior to a possible first shipment, the actual routes that would be used to ship spent nuclear fuel and high-level radioactive waste to Yucca Mountain have not been identified. However, the highway and rail routes used for analysis in this EIS are representative of routes that could be used. The highway routes conform to U.S. Department of Transportation regulations (49 CFR 397.101). These regulations, developed for transportation of Highway Route Controlled Quantities of Radioactive Materials, require such shipments to use preferred routes that would reduce the time in transit. A preferred route is an Interstate System highway, bypass, or beltway, or an alternative route designated by a state routing agency. Alternative routes could be designated by states and tribes under U.S. Department of Transportation regulations (49 CFR 397.103) that require consideration of the overall risk to the public and prior consultation with local jurisdictions and other states. Federal regulations do not restrict the routing of rail shipments. However, for the analysis, as discussed in Appendix J, Section J.1.1.3 of the EIS, DOE assumed routes for rail shipments that would provide expeditious travel, use of high quality track, and the minimum number of interchanges between railroads.

Highway (legal-weight truck) transportation of spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site would use local highways near the commercial and DOE sites and near Yucca Mountain, Interstate Highways, Interstate bypasses around metropolitan areas, and preferred routes designated by state routing agencies where applicable. DOE used the HIGHWAY computer program (DIRS 104780-Johnson et al. 1993, all) to derive representative highway routes for shipping spent nuclear fuel and high-level radioactive waste between the commercial and DOE sites and the proposed repository. Population density distributions, with the exception of those routes in Nevada, were calculated along the routes to support human health risk consequences. DOE used a Geographic Information System to calculate the population density distributions for routes in Nevada.

Appendix J describes the representative routes used for analysis in this EIS. Actual transportation mode and routing decisions would be made on a route-specific basis during the transportation planning process, if a decision was made to build a repository at Yucca Mountain.

3.2.1.2 Rail Transportation

In most cases, rail transportation of spent nuclear fuel and high-level radioactive waste would originate on track operated by shortline rail carriers that provide service to the commercial and DOE sites. At railyards near the sites, shipments in general freight service would switch from trains and tracks operated by the shortline rail carriers to trains and tracks operated by national mainline railroads. Figure 2-23 in Chapter 2 shows existing mainline track for the major U.S. railroads that DOE could use for shipments to Nevada. This interlocking network has about 290,000 kilometers (180,000 miles) of track that link the major population centers and industrial, agricultural, and energy and mineral resources of the Nation (DIRS 103069-AAR 1996, all). With the exception of shortline regional railroads that serve the commercial and DOE sites, DOE anticipates that cross-country shipments would move on mainline railroads.

Rail transportation routing of spent nuclear fuel and high-level radioactive waste shipments is not regulated by the U.S. Department of Transportation. The routes used in this EIS were derived from the INTERLINE computer program (DIRS 104781-Johnson et al. 1993, all). The identification for purposes of analysis of these routes was based on current railroad practices using existing routes. Appendix J describes the rail routes used in this EIS analysis.

3.2.1.3 Barge and Heavy-Haul Truck Transportation

Commercial sites that do not have direct rail service could ship spent nuclear fuel on heavy-haul trucks or barges to nearby railheads. Heavy-haul trucks would use local highways to carry the spent nuclear fuel to a nearby railhead for transfer to railcars for transport to Nevada. Barge shipments would use navigable waterways accessible from the nuclear plant site. These shipments would travel on the waterways to nearby railheads for transfer to railcars for transport to Nevada. Appendix J describes the heavy-haul truck and barge routes used in this EIS analysis.

3.2.2 NEVADA TRANSPORTATION

Shipments of spent nuclear fuel and high-level radioactive waste arriving in Nevada would be transported to the Yucca Mountain site by legal-weight truck, rail, or heavy-haul truck. The discussion of national transportation modes and routes in Section 3.2.1 addresses the affected environment for legal-weight truck transport from commercial and DOE facilities to the Yucca Mountain site, including travel in Nevada. This section addresses the affected environment in Nevada for candidate rail corridors, heavy-haul truck routes, and potential locations for an intermodal transfer station that DOE could use for transporting spent nuclear fuel and high-level radioactive waste and that would require new construction.

Legal-weight truck shipments in Nevada would use existing highways and would be a very small fraction of the total traffic [less than 0.5 percent of commercial vehicle traffic on U.S. Highway 95 in southern Nevada (DIRS 103405-NDOT 1997, p. 9; DIRS 104727-Cerocke 1998, p. 1). Because no new land acquisition and construction would be required to accommodate legal-weight trucks, this EIS focuses on potential impacts to human health and safety and the potential for accidents along the shipment routes from legal-weight truck shipments. Appendix J contains baseline environmental information related to human health and safety and the impacts from accident scenarios.

To allow large-capacity rail cask shipments to the repository, DOE is considering the construction of a new branch rail line or the establishment of heavy-haul truck shipment capability. Sections 3.2.2.1 and 3.2.2.2 describe the existing (or baseline) environment for each of the candidate rail corridors and heavy-haul truck routes and for potential locations for an intermodal transfer station. The locations selected for candidate rail corridor starting points and for a potential intermodal transfer station are all accessible by main rail lines that are currently in operation. National rail transportation would simply involve routings

to accommodate the selected starting point for Nevada transportation. DOE would prefer to use a branch rail line to ship spent nuclear fuel and high-level radioactive waste to Yucca Mountain.

3.2.2.1 Environmental Baseline for Potential Nevada Rail Corridors

This section discusses the environmental characteristics of land areas that could be affected by the construction and operation of a rail line to transport spent nuclear fuel and high-level radioactive waste to the proposed repository. It describes the environmental conditions in five alternative rail corridors—Caliente, Carlin, Caliente-Chalk Mountain, Jean, and Valley Modified. Chapter 2, Section 2.1.3.2, describes these corridors in more detail. Figures 6-15 through 6-19 in Chapter 6 show detailed maps for these corridors.

To define the existing (or baseline) environment along the five proposed rail corridors; DOE has compiled environmental information for each of the following subject areas:

- *Land use and ownership:* The condition of the land, current land-use practices, and land ownership information (Section 3.2.2.1.1)
- *Air quality and climate:* The quality of the air and the climate (Section 3.2.2.1.2)
- *Hydrology:* The characteristics of surface water and groundwater (Section 3.2.2.1.3)
- *Biological resources:* Important biological resources (Section 3.2.2.1.4)
- *Cultural resources:* Important cultural resources (Section 3.2.2.1.5)
- *Socioeconomic environments:* The existing socioeconomic environments (Section 3.2.2.1.6)
- *Noise and vibration:* The existing noise environments (Section 3.2.2.1.7)
- *Aesthetics:* The existing visual environments (Section 3.2.2.1.8)
- *Utilities, energy, and materials:* Existing supplies of utilities, energy, and materials (Section 3.2.2.1.9)
- *Environmental justice:* The locations of low-income and minority populations (Section 3.2.2.1.10)

A Geographic Information System provided population distributions for differing population zones (urban, rural, suburban) along the candidate rail corridors. This approach, as discussed in Section 3.2.1, differs from the analysis for national transportation, which used the INTERLINE computer program (DIRS 104781-Johnson et al. 1993, all) (see Chapter 6 for more detail).

DOE expects waste quantities generated by rail line construction and operation to be minor in comparison to those from repository construction and operation. As such, no discussion of existing waste disposal infrastructure along the routes is provided.

DOE evaluated the potential impacts of the implementing alternatives in regions of influence for each of the subject areas listed above. Table 3-35 defines these regions, which are specific to the subject areas, in which DOE could reasonably expect to predict potentially large impacts related to rail line construction and operation. The following sections describe the various environmental baselines for the rail implementing alternatives.

TERMS RELATED TO IMPLEMENTING ALTERNATIVE RAIL LINES

DOE has expanded the discussion of the affected environment in the corridors considered for rail use in this EIS. This includes the use of several terms that have specific meanings in the context of the discussion. In addition to this discussion, DOE has used these terms in the transportation analyses described in Chapter 6 and Appendix J. The following list defines these terms:

Implementing alternative – An action or proposition by DOE necessary to implement the Proposed Action and to enable the estimation of the range of reasonably foreseeable impacts of that action. In other words, an implementing alternative represents a feasible option that DOE could implement based in part on this EIS (for example, the selection of a branch rail line corridor).

The implementing rail alternatives for Nevada transportation are the five corridors—Carlin, Caliente, Caliente-Chalk Mountain, Jean, and Valley Modified—for a new branch rail line:

Corridor – A strip of land in Nevada, approximately 400 meters (0.25 mile) wide, that encompasses one of several possible routes through which DOE could build a rail line to transport spent nuclear fuel, high-level radioactive waste, and other material to and from the Yucca Mountain Repository site.

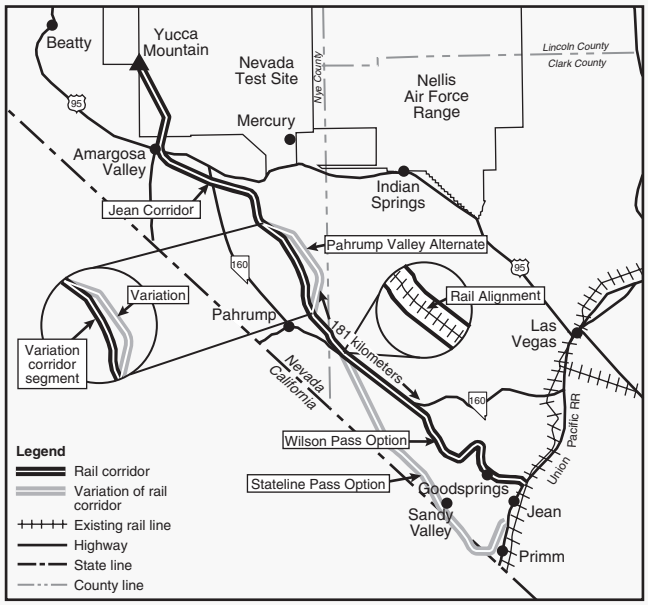
Alignment – The location of a rail line in a corridor. DOE has not determined the final alignment for a branch rail line in any of the candidate rail corridors.

Variation – In this context, a strip of land, approximately 400 meters (0.25 mile) wide, from one point along a corridor to another point on the same corridor that describes a different route. There are three types of variation:

Option – In this context, a variation based on a determination that the location of a corridor segment is essentially equivalent to that of another option, considering environmental and engineering factors.

Alternate – In this context, a variation in the location of a corridor segment to mitigate a potential adverse environmental or engineering factor.

Connection/Connector – In this context, a short variation of a corridor that connects a corridor to a commercial railroad or that connects an alternate or option of a corridor to the corridor.



DOE believes that this EIS provides the environmental impact information necessary to select a rail corridor. However, before DOE could select an alignment in that corridor, it would have to conduct additional field surveys; State, local, and tribal government consultations; engineering and environmental analyses; and National Environmental Policy Act reviews.

Table 3-35. Regions of influence for rail implementing alternatives.

Subject area	Region of influence
Land use and ownership	Land areas that would be disturbed or whose ownership or use would change as a result of construction and use of branch rail line
Air quality and climate	The atmosphere in the vicinity of sources of criteria pollutants that would be emitted during branch rail line construction and operations, and particularly the Las Vegas Valley for implementing alternatives where constructing and operating a branch rail line could contribute to the level of carbon monoxide and PM_{10} already in nonattainment of standards.
Hydrology	*Surface water:* areas near where construction would take place that would be susceptible to erosion, areas affected by permanent changes in flow, and areas downstream of construction that could be affected by eroded soil or potential spills of construction contaminants
	Groundwater: aquifers that would underlie areas of construction and operations and aquifers that might be used to obtain water for construction
Biological resources	Habitat, including jurisdictional wetlands and riparian areas inside the 400-meter-wide[a] corridors; habitat, including jurisdictional wetlands outside the corridor that could be disturbed by rail line construction and operations; habitat, including jurisdictional wetlands, and riparian areas that could be affected by permanent changes in surface-water flows; migratory ranges of big game animals that could be affected by the presence of a branch rail line
Cultural resources	Lands inside the 400-meter-wide rail corridors
Socioeconomic environments	Clark, Lincoln, Nye and other counties that a potential branch rail line would traverse
Public health and safety	800 meters[b] on each side of the rail line for incident-free transportation, 80-kilometer[c] radius for potential impacts from accident scenarios
Noise and vibration	Inhabited commercial and residential areas where noise and vibration from rail line construction and operations could be a concern
Aesthetics	The landscapes along the potential rail corridors with aesthetic qualities that could be affected by construction and operations
Utilities, energy, and materials	Local, regional, and national supply infrastructure that would be required to support rail line construction and operations
Environmental justice	Locations of minority, low-income, and Native American populations along the rail implementing alternatives; includes the regions of influence for each of the preceding individual subject or impact areas

a. 400 meters = 0.25 mile.
b. 800 meters = 0.5 mile.
c. To convert kilometers to miles, multiply by 0.62137.

3.2.2.1.1 *Land Use and Ownership*

Table 3-36 summarizes the estimated land commitment and current ownership or control of the land in each rail corridor. It addresses both the representative corridor and the range of values applicable to corridor variations. Public lands in and near the corridors are used for a variety of activities including grazing, mining, and recreation. All public land in the Caliente, Carlin, Jean, and Valley Modified Corridors is open to mining and mineral leasing laws and offroad vehicle use, with restrictions in some areas (DIRS 101504-BLM 1979, all; DIRS 101523-BLM 1994, all; DIRS 103080-BLM 1999, all). The rail corridor descriptions, unless otherwise noted, are from DIRS 104993-CRWMS M&O (1999, all), DIRS 101214-CRWMS M&O (1996, all) and DIRS 104560-YMP (1998, all).

Table 3-36. Land ownership for the candidate rail corridors.[a]

Corridor	Land in corridor: Totals (km^2)[b,c]	Ownership or control (percent)[d]: BLM	USAF	DOE	Private	Tribal	Other
Representative corridors							
Caliente	205	188 (92)	11 (5)	4.6 (2)	0.9 (<1)	0	0
Carlin	208	179 (86)	11 (5)	4.6 (2)	14 (7)	0	0
Caliente-Chalk Mountain	138	78 (57)	22 (16)	38 (27)	0.8 (<1)	0	0
Jean	72	60 (83)	0	8.5 (12)	3.5 (5)	0	0
Valley Modified	63	34 (53)	7 (11)	21 (32)	0.2 (<1)	0	1.8 (3)
Ranges for corridors with variations (all in km^2)							
Caliente	205 - 221	188 - 216	0 - 11	4.6	0.9 - 2.5	0 - 1.6	0
Carlin	205 - 218	177 - 201	0 - 11	4.6	7.3 - 1.5	0 - 1.6	0
Caliente-Chalk Mountain	138 - 153	77 - 89	22	32 - 38	0.8 - 1.1	0	0
Jean	72 - 82	60 - 69	0	8.5	0.1 - 3.5	0	0
Valley Modified	63 - 65	30 - 37	3.6 - 7.5	21	0 - 0.2	0	1.7 - 4.1

a. Source: DIRS 155549-Skorska (2001, all).
b. To convert square kilometers (km^2) to acres, multiply by 247.1.
c. Totals might differ from sums due to rounding.
d. Bureau of Land Management (BLM) property is public land administered by the Bureau; U.S. Air Force property is the Nellis Air Force Range; DOE property is the Nevada Test Site; tribal land is the Timbisha Shoshone Trust Lands; and the Other designation is the Desert National Wildlife Range managed by the Fish and Wildlife Service.

Caliente. Most of the lands associated with the Caliente Corridor (92 percent) are public lands managed by the Ely, Battle Mountain, and Las Vegas offices of the Bureau of Land Management. Detailed information on land use is available in the *Proposed Tonopah Resource Management Plan and Final Environmental Impact Statement* (DIRS 101523-BLM 1994, all), the *Department of the Interior Final Environmental Impact Statement, Proposed Domestic Livestock Grazing Management Program for the Caliente Area* (DIRS 101504-BLM 1979, all), the *Final Legislative Environmental Impact Statement, Timbisha Homeland* (DIRS 154121-DOI 2000, all) the *Caliente Management Framework Plan Amendment and Environmental Impact Statement for the Management of Desert Tortoise Habitat* (DIRS 103080-BLM 1999, all), and the *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement* (DIRS 103079-BLM 1998, all).

The U.S. Air Force uses about 5 percent of the lands associated with the Caliente Corridor. The corridor crosses the western boundary of the Nellis Air Force Range near Goldfield and again northeast of Scottys Junction. Detailed information on current and future uses of the Nellis Air Force Range is available in the *Renewal of the Nellis Air Force Range Land Withdrawal: Legislative Environmental Impact Statement* (DIRS 103472-USAF 1999, all).

DOE uses about 2 percent of the lands associated with the Caliente Corridor. The corridor enters the Nevada Test Site south of Beatty. Detailed information on current and future uses of the Nevada Test Site is available in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DIRS 101811-DOE 1996, all).

Less than 1 percent of the land associated with the Caliente Corridor is private. The corridor crosses private land near Caliente.

The Caliente Corridor (Chapter 2, Figure 2-26) begins in Lincoln County, at an existing section of the Union Pacific Railroad at Eccles, and moves north across mostly Bureau of Land Management lands toward U.S. 93 near Comet Siding, which is south of Panaca. Two alternate sections are being evaluated as the beginning point of this corridor. One is west of a section of the Union Pacific Railroad at Crestline

[approximately 3.2 kilometers (2 miles) west of the Dixie National Forest]. From that point it continues west across Bureau of Land Management lands to the point south of Panaca where it joins the main corridor. The other alternate section originates at the Town of Caliente. This section travels north along an existing Union Pacific rail line, running parallel to U.S. 93 to the intersection with the main rail corridor in the same area just south of Panaca. Although the 1990 Bureau of Land Management Master Title Plats indicate that the former Union Pacific right-of-way remains active, the right-of-way ownership for the abandoned rail bed is not clear. Each of these starting sections passes through Meadow Valley Wash. Approximately 3.2 kilometers (2 miles) north of this corridor (just north of Panaca) is the Cathedral Gorge State Park.

The section from Caliente has seen more development and has more inhabitants than the Crestline and the Eccles corridor initiation locations. A utility transmission line extends from Caliente to an area west of Panaca. The Eccles, Caliente, and Crestline Options cross private lands. There are numerous houses, farms, and ranches north of Caliente and extending toward Panaca. Areas of ponded water and streams associated with the Meadow Valley Wash occur through this area along the eastern side of U.S. 93 (which in this area is part of the State Scenic Byway). The Crestline and Caliente Options cross two rights-of-way: one for U.S. 93 and one telephone; the Eccles Option does not cross any rights-of-way. Past the area where the alternate starting sections converge, the corridor passes west on Bureau of Land Management lands near Bennett Springs Road, moves through the Highland Range in the area of Bennett Pass, and continues across Bureau land in the northern section of the North Pahroc Range. Through this section the corridor passes through two pipeline, one telephone, and two road rights-of-way, and east of a wilderness study area. The corridor then moves through Bureau lands west of Nevada State Route 318, along the Lincoln/Nye County line north of the Seaman Range. The corridor passes just north of the Weepah Springs Wilderness Study Area located in the vicinity of Timber Mountain in Lincoln County.

The rail corridor splits in the area of Timber Mountain Pass, with a possible section (the White River Alternate) going north of the Seaman Range into the White River Valley and then passing back to the south and west along and through the Golden Gate Range. The corridor continues on Bureau of Land Management lands in a general southwesterly direction and back into Lincoln County through Garden and Sand Spring Valleys. In Garden Valley, the corridor and the Garden Valley Alternate wind around private land. The corridor crosses one road and one pipeline right-of-way, and five oil or gas leases. The Garden Valley Alternate crosses two road and two pipeline rights-of-way. The corridor continues on Bureau land and passes generally to the southwest into Nye County, to land around the Reveille Range north of the Cedar Pipeline Ranch. It then turns north toward Warm Springs, passing between the Reveille and Kawich Ranges, and passing to the east of the Eden Creek Ranch. As the corridor passes between the southern portion of the Kawich and South Reveille Ranges, it passes just east of the Kawich Wilderness Study Area and encroaches on the South Reveille Wilderness Study Areas. The corridor turns southwest again toward the Nellis Air Force Range, passing the Town of Golden Arrow and the Reeds Ranch, which is just north of the Nellis Range. Also north of the Nellis Range, the Kawich Range contains several ranches and small towns and communities, as well as abandoned and current mining operations.

The Toiyabe National Forest is approximately 6.4 kilometers (4 miles) northwest of the corridor as it passes north of the Kawich Range. Numerous two-track roads surround the Kawich Range providing access to grazing allotments, mining claims, and recreational areas. The corridor then passes along the northern boundary of the Nellis Air Force Range through Ralston Valley. From the merging of the Garden Valley Alternate to the western boundary of the Nellis Range, the corridor crosses or travels along two Bureau of Land Management utility corridors. The corridor also crosses two road, two pipeline, and two powerline rights-of-way. It then turns south along the western boundary of the Nellis Range. Both gravel and two-track roads are present in that area, and throughout the remainder of the corridor, with many entering the Nellis Range.

The corridor splits east of the Town of Goldfield, with the alternate segment going west of Blackcap Mountain, through Bureau of Land Management land and two parcels of private property to the south along the Nye/Esmeralda County line. The corridor traverses a section on the Nellis Air Force Range. The corridor and the alternate segment rejoin in Bureau land along the Nye/Esmeralda County line near the Town of Ralston.

The corridor proceeds south until it splits again around the Town of Scottys Junction in Nye County. One segment, the Bonnie Claire Alternate, passes to the west, crossing U.S. 95 and State Route 267. This western segment passes through 11 square kilometers (2,800 acres) of formerly Bureau of Land Management lands transferred to the Timbisha Shoshone. This parcel of land is being proposed for Tribal economic development (tourism) and Tribal housing (DIRS 154121-DOI 2000, all). In addition to rights-of-way for U.S. 95 and State Route 267, the Bonnie Claire Alternate crosses two powerline and one telephone rights-of-way. It passes through a portion of private land south of U.S. 95. The corridor crosses into the Nellis Air Force Range for a short distance northeast of Scottys Junction before moving back into Bureau of Land Management land. The alternate segment merges with the corridor, which then follows U.S. 95 toward the Town of Beatty, which it passes to the east. A minor segment, the Oasis Alternate, goes slightly farther east of Beatty before merging with the corridor. A little farther to the southeast, the Beatty Wash Alternate then diverges for a short distance until it realigns with the corridor and crosses a Bureau of Land Management utility corridor several times.

Death Valley National Park, west of Beatty at the point closest to the rail corridor, is approximately 11 kilometers (7 miles) to the west. The area surrounding Beatty and extending southeast toward Amargosa Valley has several small towns and numerous current and historic mining operations. There are also campgrounds along U.S. 95. The corridor bypasses most of these areas by moving between Beatty and the Nellis Air Force Range. It continues generally to the south and enters DOE property west of Yucca Mountain and north of the Town of Amargosa Valley.

Carlin. Most of the lands associated with the Carlin Corridor (about 86 percent) are public lands managed by the Battle Mountain and Las Vegas offices of the Bureau of Land Management. Detailed information on land use is available in the *Draft Shoshone-Eureka Resource Management Plan and Environmental Impact Statement* (DIRS 103077-BLM 1983, all), the *Proposed Tonopah Resource Management Plan and Final Environmental Impact Statement* (DIRS 101523-BLM 1994, all), the *Final Legislative Environmental Impact Statement, Timbisha Homeland* (DIRS 154121-DOI 2000, all) and the *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement* (DIRS 103079-BLM 1998, all).

The U.S. Air Force uses about 5 percent of the lands associated with the Carlin Corridor. The combined Carlin/Caliente Corridor crosses into the western portion of the Nellis Air Force Range near Goldfield and again northeast of Scottys Junction. Detailed information on current and future uses of the Nellis Air Force Range is available in DIRS 103472-USAF (1999, all).

DOE uses about 2 percent of the lands associated with the Carlin Corridor. The combined Carlin/Caliente Corridor enters the Nevada Test Site south of Beatty. Detailed information on current and future uses of the Nevada Test Site is available in DIRS 101811-DOE (1996, all).

About 7 percent of the land associated with the Carlin Corridor is private. The corridor crosses private roads in the northern part of the route, from Beowawe through Crescent Valley.

The Carlin Corridor (Chapter 2, Figure 2-26) begins near the Town of Beowawe in Eureka County, at an existing Union Pacific Railroad line. The corridor moves south along Crescent Valley through a mix of private and Bureau of Land Management lands that extend south of the Town of Crescent Valley, near the Dean Ranch. The corridor crosses numerous gravel and two-track roads, most of which lead to adjoining

valleys, ranches, or grazing allotments in Crescent Valley and in the adjacent mountains. The corridor runs east of State Route 306 and continues south toward the Dean Ranch.

Just north of the Dean Ranch and east of State Route 306, the corridor splits. The corridor itself crosses State Route 306 to the west and continues south and west of the Dean Ranch, and the alternate segment travels south and east of the Dean Ranch. The two rejoin south of the ranch on Bureau of Land Management land near the Cortez Airstrip west of the Cortez Gold Mine. An expansion of the Cortez Gold Mine operations, recently approved by the Bureau of Land Management (DIRS 155095-BLM 2000, all), involves the disturbance of an additional 18 square kilometers (4,450 acres) of public lands. This action includes expansion of an existing open pit, extension of process solution pipelines, modifications to the existing road between Gold Acres and the Cortez milling facility, the increase of waste rock and tailings facilities, and a pipeline right-of-way from the mine to the Dean Ranch for supplying water to the ranch. The corridor passes from Eureka County into Lander County near the Dean Ranch. Through Crescent Valley it crosses private lands and two road, one powerline, and two telephone rights-of-way. One of the road rights-of-way runs from the Gold Acres Mine to the Cortez Mine milling facility. The Crescent Valley Alternate crosses private lands, one right-of-way, and another road with no right-of-way listed. Near the Town of Gold Acres, the Gold Acres Mine and its spoils pile are the dominant features in the valley. There are numerous active and abandoned mine sites in the area of the Shoshone Range and the Cortez Mountains. Also in this area are several small towns and numerous ranches in the Crescent Valley and Grass Valley.

The corridor passes east and south of the Cortez Airstrip and through a northern portion of the Toiyabe Range that is not part of the Toiyabe National Forest. In this section of the Toiyabe Range, there is a split in the corridor for engineering design reasons. The corridor passes into Grass Valley west of Hot Springs Point, extending to the south, east of the Cowboy Rest Ranch. It follows the western side of the valley until it splits north of the Grass Valley Ranch. The corridor segment runs west of the Grass Valley Ranch, where it crosses private lands adjacent to Bureau of Land Management lands. Roads connect Grass Valley to the surrounding areas, most of which appear to be two-track roads that extend from main gravel roads in the valley to the mountainous areas on both sides of the valley. Some of these two-track roads might be for recreation, but are probably used to access Bureau grazing or mining allotments in the area. The corridor follows Bureau lands and continues to the south. The alternate segment (the Steiner Creek Alternate) passes to the east of the Grass Valley Ranch, along the western base of the Simpson Park Mountains. The Steiner Creek Alternate passes close to the Simpson Park Wilderness Study Area in Lander County just east of the Grass Valley Ranch. The corridor and alternate segments rejoin near Bates Mountain and continue south through Bureau lands in Rye Patch Canyon, still following the western edge of the Simpson Park Mountains. In this area, the corridor splits again, still on Bureau lands. The corridor and the Rye Patch Alternate diverge to bypass sensitive habitat at Rye Patch Spring. Both cross two road rights-of-way. At this point, the corridor splits into two major variations, the Big Smoky Valley Option and the Monitor Valley Option, both of which run mostly through Bureau lands. Soon after this split, both cross the Nye/Lander County line.

The Big Smoky Valley portion of the corridor begins just south of the Givens Ranch in Rye Patch Canyon and continues south along the eastern side of the valley. U.S. 50, a State Scenic Byway, crosses the Valley from east to west, just to the south of the Givens Ranch. The Lander/Nye County line is approximately 26 kilometers (16 miles) south of U.S. 50. South of the county line, the Big Smoky Valley Alternate crosses three road, one flume, four powerline, and two pipeline rights-of-way, and a Desert Land Entry withdrawal parcel west of the Town of Hadley. It also passes through a Bureau of Land Management utility corridor. The Big Smoky Valley is comprised of Bureau lands and private property. The Bureau lands consist primarily of grazing allotments. The main road, State Route 376, runs along the western side of the valley. Other roads cross the valley, generally running east-west, leading to the National Forest on both sides of the valley and to small communities and public recreation areas. Some

of these are Forest Service roads that cross the National Forest and connect with State or other Forest Service roads in adjacent valleys. One of the most frequently used public recreation areas is Peavine Public Campgrounds in the southern part of the Toiyabe National Forest in the Toiyabe Range. There are numerous ranches, most along the western edge of the valley. Small roads (two-tracks) run along the valley floor, generally through grazing allotments. A power line runs along the route, just west of the Town of Millers, and continues north up the valley near Manhattan. In this area, the valley is flanked by the Toquima and Toiyabe Ranges, both of which are part of the Toiyabe National Forest. The southern portion of Big Smoky Valley narrows, and there are many small towns in this portion of the valley, limiting the opportunity to avoid private land.

The corridor passes west of State Route 376 and proceeds to the west of the Round Mountain Golf Course near the Town of Hadley and its airport. The route follows the western edge of the valley and continues to the south near the San Antonio Ranch, running between the Town of Midway Station and the San Antonio Mountains, where there is a large section of private land, most of which probably is associated with mining. The route crosses Secondary State Route 89 and, after crossing into Esmeralda County, continues south across U.S. 95/6 west of Tonopah. It then turns to the southeast toward Nellis Air Force Range, crossing U.S. 95 again and moving south and east of the Town of Klondike, where it joins with the Monitor Valley Alternate.

The Monitor Valley Option runs east from the Rye Patch Canyon area along the Simpson Park Mountains, near the Hicks Summit Petroglyph Recreation Area. It crosses U.S. 50 and extends south into Monitor Valley, generally following Stoneberger Creek and adjacent to a two-track road along the western side of the valley. It then continues through the valley east of Secondary State Route 82 and moves into Nye County, passing east of the Monitor Ranch between Potts and the Toquima Range to the west. Monitor Valley is bounded on both east and west by the Toiyabe National Forest, which includes several wildlife areas, recreation areas, ranches, and small communities. Numerous roads cross the valley, leading through the adjacent mountain ranges or to isolated ranches and grazing allotments. The option remains to the east of Secondary State Route 82, continuing south to the community of Belmont, where the valley narrows, and follows along or just west of Secondary State Route 82. Past Belmont, the option follows Secondary State Route 82 to its intersection with State Route 376 and then continues south through Ralston Valley, crossing U.S. 6 west of the Tonopah Municipal Airport. There is a state prison on the western side of State Route 376, approximately 13 kilometers (8 miles) north of U.S. 6. The option continues south until it rejoins the corridor near the Nye/Esmeralda County line. In Monitor Valley, the option crosses one telephone, two road, and one pipeline rights-of-way. There are two Desert Land Entry parcels between the Town of Hadley and the Nye/Esmeralda County line.

The rejoined corridor and option intersect the Caliente Corridor (as described above) near Mud Lake in the northwest corner of the Nellis Air Force Range before continuing to Yucca Mountain. As with the Caliente Corridor, the Carlin Corridor's Bonnie Claire Alternate passes through an area recently designated for the creation of a section of the Timbisha Shoshone Reservation on lands transferred from the Bureau of Land Management (DIRS 154121-DOI 2000, all).

Caliente-Chalk Mountain. Most of the lands associated with the Caliente-Chalk Mountain Corridor (about 57 percent) are public lands managed by the Ely Office of the Bureau of Land Management. Detailed information on land use is available in DIRS 101504-BLM (1979, all) and DIRS 103080-BLM (1999, all).

The U.S. Air Force uses about 16 percent of the lands associated with the Caliente-Chalk Mountain Corridor. The corridor enters the Nellis Air Force Range west of Rachel, Nevada, and travels south through the range. Detailed information on current and future uses of the Nellis Air Force Range is available in DIRS 103472-USAF (1999, all).

DOE uses about 27 percent of the lands associated with the Caliente-Chalk Mountain Corridor. The corridor crosses the northern border of the Nevada Test Site and travels to the Yucca Mountain site. Detailed information on current and future uses of the Nevada Test Site is available in DIRS 101811-DOE (1996, all).

Less than 1 percent of the lands associated with the Caliente-Chalk Mountain Corridor is private. The combined Caliente and Caliente-Chalk Mountain Corridor crosses private lands near Caliente.

The beginning portion of the Caliente-Chalk Mountain Corridor (Chapter 2, Figure 2-26) is the same as the beginning portion of the Caliente Corridor described above. The two corridors and their variations are identical until they reach the area of Sand Spring Valley.

At Sand Spring Valley, the Caliente-Chalk Mountain Corridor splits from the Caliente Corridor and continues on Bureau of Land Management land to pass generally south along the Lincoln/Nye County line. The corridor crosses State Route 375 and enters the Nellis Air Force Range east of Queen City Summit.

The Caliente-Chalk Mountain Corridor continues south just west of Chalk Mountain and into the northern portion of Emigrant Valley. It passes numerous paved and two-track roads through this area. The corridor passes almost due south into the Nevada Test Site. Once inside the Test Site the corridor divides just north of the main infrastructure area. The Orange Blossom Road Option continues generally to the south just east of the infrastructure area in the eastern portion of the Test Site. This option continues southeast of French Peak and then passes generally to the west around infrastructure and just north of Skull Mountain. It continues generally westward, passing infrastructure south of the Calico Hills, crossing Fortymile Wash, and into the proposed repository area. It crosses a power right-of-way twice and a waterline right-of-way. It also crosses Nevada Test Site roads.

The Mercury Highway Option splits from the corridor just north of the large Nevada Test Site infrastructure area. This option turns generally south along the east of the Elena Range through Yucca Flat and the center of the Test Site, crossing roads and bypassing existing infrastructure until it joins with the Orange Blossom Road Option just north of Skull Mountain and continues to the proposed repository site.

The Area 4 Alternate splits from the Mercury Highway Option along the western edge of the Nevada Test Site infrastructure area in the vicinity of Syncline Ridge where it joins with the Tonopah Option. This option crosses the Mercury Highway.

The Mine Mountain Alternate splits from the Area 4 Alternate in the vicinity of Mine Mountain Junction to minimize impacts to cultural sites in the area. It splits for only a short distance and then rejoins the Area 4 Alternate.

The Tonopah Option travels just inside the northern Nevada Test Site boundary westward until it begins to turn to the south along the eastern edge of the Elena Range bypassing Test Site infrastructure areas. The route passes along the western edge of Barren Wash until it strikes westward south of the Calico Hills and continues across Fortymile Wash.

The Caliente-Chalk Mountain Corridor crosses lands in which paved, gravel, and two-track roads are abundant. These roads provide access to grazing and mining allotments and recreational areas on Bureau of Land Management lands. Some roads provide access to recreational areas on State and Federal lands (Humboldt National Forest).

Jean. Most of the lands associated with the Jean Corridor (about 83 percent) are public lands managed by the Las Vegas office of the Bureau of Land Management. Detailed information on land use is available in DIRS 103079-BLM (1998, all).

DOE uses about 12 percent of the lands associated with the Jean Corridor. The corridor enters the Nevada Test Site near Amargosa Valley traveling north to the Yucca Mountain site. Detailed information on current and future uses of the Nevada Test Site is available in DIRS 101811-DOE (1996, all).

About 5 percent of the land associated with the Jean Corridor is private. The corridor crosses private lands in the Pahrump Valley.

The Jean Corridor consists of the Wilson Pass Option (the corridor) and the Stateline Pass Option starting sections (Chapter 2, Figure 2-26). The Wilson Pass Option begins along the Union Pacific rail line just north of Jean. The corridor extends northwest and runs north of State Route 161, along Bureau of Land Management lands toward Goodsprings, and along the southern edge of the Bird Spring Range. It crosses two pipeline, three road, and two powerline rights-of-way.

The corridor passes through the Bureau of Land Management mining area containing the Bluejay, Snowstorm, and Pilgrim Mines, and runs within about 2 kilometers (1.2 miles) south of the Toiyabe National Forest in the Spring Mountains. The area contains a number of access roads to the mine sights. Several State and access roads associated with the National Forest cross the corridor. The corridor passes just to the south of the National Forest and traverses Wilson Pass along Bureau lands, continuing to the northwest until its intersection with State Route 160. It then continues across a Bureau utility corridor and continues on Bureau lands north of State Route 160 until it intersects the Stateline Pass Option.

The Stateline Pass Option begins in Ivanpah Valley along the Union Pacific rail line south of Jean and just north of Roach Lake, in an area that Clark County is proposing as the location for a cargo airport and other purposes. This option passes through Bureau of Land Management lands, going south through mining areas along the California/Nevada state line and then turns northwest, skirting private land around the Sandy Valley community. It crosses two pipeline, two road/highway, and one powerline and telephone rights-of-way. It also passes near the Stateline Wilderness Area.

Continuing along Bureau of Land Management lands just north of Secondary State Route 16, the Stateline Pass Option crosses State Route 160 to intersect the Jean Corridor east of Pahrump. In the Pahrump vicinity, State roads access the national forests to the north, and there are several tracks and trails in the area.

The corridor then crosses from Clark County into Nye County before splitting, with the corridor passing close to the Town of Pahrump and the Pahrump Valley Alternate passing closer to the Spring Mountains east of Pahrump. The corridor segment crosses several parcels of private property. The alternate segment abuts the Toiyabe National Forest and a Bureau of Land Management utility corridor and then enters the utility corridor. The corridor and alternate segments rejoin near the community of Johnnie, just east of State Route 160. There are several tracks and trails in this area. The corridor continues to the north until it passes just south of U.S. 95, where it turns northwest through Bureau of Land Management land north of the Ash Meadows National Wildlife Refuge [approximately 14 kilometers (9 miles) west of Johnnie].

Continuing to the north across the Amargosa Desert, the corridor crosses State Route 160, several gravel roads, and a number of two-track roads on Bureau of Land Management land. The corridor crosses a Bureau utility corridor, two telephone, and two powerline rights-of-way. It then crosses U.S. 95 and enters Nevada Test Site property northeast of the Town of Amargosa Valley and continues to the proposed repository site at Yucca Mountain.

Valley Modified. About 53 percent of the lands associated with the Valley Modified Corridor are public lands managed by the Las Vegas office of the Bureau of Land Management. Detailed information on land use is available in DIRS 103079-BLM (1998, all).

The U.S. Air Force uses about 11 percent of the lands associated with the Valley Modified Corridor. The corridor crosses Nellis Air Force Base northeast of Las Vegas and the Nellis Air Force Range near Indian Springs. Detailed information on current and future uses of the Nellis Air Force Range is available in DIRS 103472-USAF (1999, all).

DOE uses about 32 percent of the lands associated with the Valley Modified Corridor. The corridor enters the Nevada Test Site near Mercury, traveling northwest to the Yucca Mountain site. Detailed information on current and future uses of the Nevada Test Site is available in DIRS 101811-DOE (1996, all).

The Fish and Wildlife Service manages about 3 percent of the lands associated with the Valley Modified Corridor as part of the Desert National Wildlife Refuge, which was established in 1936 for the protection and preservation of desert bighorn sheep. Portions of this refuge overlap the Nellis Air Force Range and are controlled jointly by the Air Force and the Fish and Wildlife Service. Use and public access to the joint-use area of the Desert National Wildlife Range and Nellis Air Force Range are restricted by a memorandum of understanding (DIRS 103472-USAF 1999, Appendix C). The Valley Modified corridor passes potential Wilderness Study Areas under consideration by Congress. The Quail Springs Wilderness Study Area, and the Nellis Air Force Range A, B, and C Wilderness Study Areas, located on Bureau of Land Management lands, were inventoried under the 1976 Federal Land Policy and Management Act in support of the 1964 Wilderness Act. Wilderness Study Areas cannot be altered unless they have been released from the program. At this time, there has been no action to release these areas.

The Valley Modified Corridor begins along the Union Pacific rail line in the Apex/Las Vegas area of Clark County, Nevada (Chapter 2, Figure 2-26). The corridor has two possible starting locations and two possible variations, until they merge north of the City of Las Vegas in the Apex area. Clark County is proposing an industrial park on lands transferred from the Bureau of Land Management that would encompass the primary corridor origination location. The Valley Connection starting segment begins in a Bureau corridor near private property in the vicinity of the City of North Las Vegas and travels along the Union Pacific rail line toward Apex until it turns west. The alternate segment crosses three powerline rights-of-way before turning to the west.

After the corridor turns west from either starting location, there are again two options--the corridor itself and the Sheep Mountain Option slightly north of the corridor. Both the corridor and the alternate cross Bureau of Land Management lands and then enter the Nellis Small Arms Range. After leaving the Small Arms Range, they cross the Nellis Air Force Range Wilderness Study Areas A, B, and C and then pass through the Desert National Wildlife Range and the Quail Springs Wilderness Study Area. Both cross several gravel and two-track roads, some of which enter the Desert National Wildlife Range to the north. The corridor and alternate merge before the corridor crosses the Wildlife Range and the Quail Springs Wilderness Study Area a second time. A powerline follows U.S. 95 from its intersection with State Route 157 to Mercury, where it enters the Nevada Test Site.

After the corridor and alternate join, the corridor continues to the northwest through the Las Vegas Valley, passing northeast of U.S. 95 and just to the north of Floyd Lamb State Park and the Las Vegas Paiute Reservation. It crosses several roads and two-track roads that lead into the Desert National Wildlife Range. Continuing to the northwest and running just north of U.S. 95, the corridor crosses an area close to the Desert National Wildlife Range, Desert View Natural Environmental Area, and Nellis Air Force Range.

The corridor then splits east of Indian Springs, with both segments continuing west and crossing from Clark County into Nye County east of Mercury. The northern segment (the corridor) bypasses Indian Springs and Cactus Springs, running to the north across the Desert National Wildlife Range and Bureau of Land Management lands until it merges with the southern segment just south of Mercury. The corridor crosses existing roads and tracks in the area south of Mercury, in the vicinity of Desert Rock.

The Indian Hills Alternate passes south of U.S. 95 across Bureau of Land Management lands until it crosses back to the north of U.S. 95 and joins the corridor south of Mercury. After the routes join, the corridor enters DOE property just southwest of Mercury and continues south of Skull Mountain to Yucca Mountain.

3.2.2.1.2 *Air Quality and Climate*

This section contains information on the existing air quality in areas through which the candidate rail corridors pass. It also provides background on the general climate in those areas.

Air Quality. The Caliente, Carlin, Caliente-Chalk Mountain, and Jean Corridors pass through rural parts of Nevada that are either unclassifiable or in attainment for criteria pollutants (DIRS 148123-EPA 1999, all; DIRS 149905-EPA 1999, all; DIRS 149906-EPA 1999, all; DIRS 149907-EPA 1999, all). There are no State air-quality monitoring stations in these corridors (DIRS 103404-Bureau of Air Quality 1999, pp. A1-1 through A1-9).

The Valley Modified Corridor crosses central Clark County at the north end of the Las Vegas Valley and continues in a northwest direction toward the Nevada Test Site. The air quality in the part of the corridor that passes through the Las Vegas Valley and extends part of the way to Indian Springs is in nonattainment for particulate matter with a diameter of less than 10 micrometers (PM_{10}). Clark County adopted a revised implementation plan in 2001 for demonstrating PM_{10} attainment (DIRS 155557-Clark County 2001, Executive Summary) that includes a request to the Environmental Protection Agency to extend the year for attainment demonstration of the 24-hour standard from 2001 to 2006. The plan includes proposals to reduce emissions of particulate matter from a variety of sources. A decision has not been made on the county's request for an extension to the attainment period. The Environmental Protection Agency has acknowledged the request, but has not yet completed its formal review of the revised implementation plan (DIRS 156896-Davis 2001, all).

In addition, the Las Vegas Valley air basin is in nonattainment for the 3-hour carbon monoxide standard, largely the result of vehicular emissions. Clark County adopted a State Implementation Plan for carbon monoxide to achieve the attainment criteria by December 2000 (DIRS 156706-Clark County 2000, all). The Plan outlines a methodology to maintain acceptable carbon monoxide concentrations through transportation planning and control measures. The Environmental Protection Agency has deemed the motor vehicle carbon monoxide estimates indicated in the Plan *adequate* (65 *FR* 71313; November 30, 2000). In 2000, monitoring results indicated that the Plan criteria has been met (DIRS 157158-EPA 2000, all); however, the area is still officially classified as in nonattainment.

Climate. There are two general climate descriptions for the five rail corridors: one for the three corridors that approach the Yucca Mountain site from the north and one for the two corridors that approach the site from the south or southeast. The Caliente, Carlin, and Caliente-Chalk Mountain Corridors approach from the north and cross a number of mountain ranges and valleys with elevations well above 1,500 meters (4,900 feet). Although much of Nevada is arid, in central Nye County the annual precipitation exceeds 20 centimeters (8 inches), and the annual snowfall exceeds 25 centimeters (10 inches); annual precipitation exceeds 40 centimeters (16 inches) in some mountainous areas, and snowfall exceeds 100 centimeters (40 inches) (DIRS 106182-Houghton, Sakamoto, and Gifford 1975, pp. 45, 49, and 52). Occasional brief periods of intense rainfall at rates exceeding 5 centimeters

(2 inches) an hour can occur in the summer. Each of the three corridors approaching Yucca Mountain from the north pass through central Nye County, and DOE believes that the climate described is a reasonable average for conditions along these corridors.

The Jean and Valley Modified Corridors approach the Yucca Mountain site from the south where precipitation is generally between 10 and 20 centimeters (4 and 8 inches) per year and snowfall is rare. Occasional brief periods of intense rainfall at rates exceeding 5 centimeters (2 inches) an hour can occur in the summer (DIRS 106182-Houghton, Sakamoto, and Gifford 1975, pp. 45, 49, and 52).

3.2.2.1.3 *Hydrology*

This EIS discusses hydrologic conditions in terms of surface water and groundwater.

3.2.2.1.3.1 Surface Water. Researchers studied the alternative rail corridors for their proximity to sensitive environmental resources, including surface waters and riparian lands (DIRS 104593-CRWMS M&O 1999, Appendixes E, F, G, H, and I). The goal in planning the corridors was to avoid springs and riparian lands by 400 meters (1,300 feet) if possible. Table 3-37 summarizes potential surface-water-related resources along the candidate corridors. It lists resources within the 400-meter corridor or within a 1-kilometer (0.6-mile) region of influence along the corridor. Table 3-38 presents similar information for the variation segments. The last column of Table 3-37 identifies water resources that DOE would avoid by using a specified variation rather than the corresponding segment along the rail corridor. Water resources along the variation segment that would be "substituted" can be linked from Table 3-38. If the same water resource would be in proximity to both the corridor and variation segment, it is marked as "Avoided" in Table 3-37, but appears again in Table 3-38 for the variation.

Potential hydrologic hazards along the rail corridors include flash floods and debris flow. All corridors have potential flash flooding concerns. DOE would design and build a rail line that would be able to withstand a 100-year flood event safely.

Appendix L of this environmental impact statement is a floodplain/wetland assessment for the proposed repository action, including the Nevada transportation routes. This appendix includes the results of efforts to identify flood zones along the potential rail corridors and their associated alternate segments through the use of Flood Insurance Rate Maps published by the Federal Emergency Management Agency. The flood zone maps do not provide complete coverage for any of the rail corridors primarily because there are none for the large areas of the Nevada Test Site and the Nellis Air Force Range. In some areas the maps do, however, provide a good indication of 100-year flood zones that might exist in the rail corridors. Consistent with the distribution of surface-water resources listed in Table 3-37, the floodplain information in Appendix L (see Table L-4) indicates the greatest number of different flood zones would occur along the Caliente and Carlin Corridors.

3.2.2.1.3.2 Groundwater. Groundwater basins that the candidate rail corridors cross represent part of the potentially affected environment. As described for groundwater in the immediate region of Yucca Mountain (Section 3.1.4.2.1), the State of Nevada has been divided into groundwater basins and sub-basins. The sub-basins are called hydrographic areas. A map of these areas (DIRS 101486-Bauer et al. 1996, p. 543) was overlain with a drawing of the proposed rail corridors to produce a reasonable approximation of the areas that would be crossed by each corridor. Table 3-39 lists results of this effort for the rail corridors. Table 3-40 presents similar information for the different segments associated with the corridor variations. The tables also list estimates of the perennial yield for each hydrographic area crossed and if the area is a State Designated Groundwater Basin [a hydrographic area in which the permitted water rights approach or exceed the estimated perennial yield and the water resources are depleted or require additional administration, including a State declaration of preferred uses (municipal

Table 3-37. Surface-water-related resources along candidate rail corridors[a] (page 1 of 2).

Rail corridor	Distance from corridor (kilometers)[b]	Feature	Avoided by variation (Yes or No)[c]
Caliente			
Eccles Siding to Meadow Valley Wash	Within	Riparian area/stream – corridor crosses and is adjacent to stream and riparian area in Meadow Valley Wash	Y-1, 2
Meadow Valley to Sand Spring Valley	1.0	Spring – Bennett Spring, 3.2 kilometers southeast of Bennett Pass	N
	0.05 - 2.6	Springs – group of five springs (Deadman, Coal, Black Rock, Hamilton, and one unnamed) east of White River	N
	Within	Riparian/river – corridor parallels (and crosses) the White River for about 10 kilometers. August 1997 survey found river to be mostly underground with ephemeral washes above ground.	N
	0.8	Spring – McCutchen Spring, north of Worthington Mountains	N
Sand Spring Valley to Mud Lake	0.02	Spring – Black Spring, south of Warm Springs	N
Mud Lake to Yucca Mountain	Within - 2.5	Springs – numerous springs and seeps along Amargosa River in Oasis Valley	Y-8
	Within - 0.3	Riparian area/stream – designated area east of Oasis Valley, flowing into Amargosa River, also riparian area, with persistent water and extensive wet meadows near springs and seeps	Y-8
	0.3 - 1.3	Springs – group of 13 unnamed springs in Oasis Valley north of Beatty	Y-8
Carlin			
Beowawe to Austin	0.5	Spring – Tub Spring, northeast of Red Mountain	Y-11
	0.8	Spring – Red Mountain Spring, east of Red Mountain	Y-11
	0.9	Spring – Summit Spring, west of corridor and south of Red Mountain	N
	0.4	Spring – Dry Canyon Spring, west of Hot Springs Point	N
	0.8	Spring – unnamed spring on eastern slope of Toiyabe Range, southwest of Hot Springs Point	N
	1.0	Riparian area – intermittent riparian area associated with Rosebush Creek, in western Grass Valley, north of Mount Callaghan	Y-12
	Within	Riparian/creek – corridor crosses Skull Creek, portions of which have been designated riparian areas	Y-12
	Within	Riparian/creek – corridor crosses intermittent Ox Corral Creek; portions designated as riparian habitat. An August 1997 survey found creek dry with no riparian vegetation present	Y-12
	0.1	Spring – Rye Patch Spring, at north entrance of Rye Patch Canyon, west of Bates Mountain	N
	Within	Riparian area – corridor crosses and parallels riparian area in Rye Patch Canyon	Y-13
	0.7	Spring – Bullrush Spring, east of Rye Patch Canyon	N
Austin to Mud Lake	0.8	Springs – group of 35 unnamed springs, about 25 kilometers north of Round Mountain on east side of Big Smoky Valley	Y-14
	0.6	Riparian area – marsh area formed from group of 35 springs	Y-14
	0.6	Spring – Mustang Spring, south of Seyler Reservoir	Y-14
	0.3	Riparian/reservoir – Seyler Reservoir (seasonal), west of Manhattan	Y-14

Table 3-37. Surface-water-related resources along candidate rail corridors[a] (page 2 of 2).

Rail corridor	Distance from corridor (kilometers)[b]	Feature	Avoided by variation (Yes or No)[c]
Carlin (continued)			
Mud Lake to Yucca Mountain		See Caliente corridor	
Caliente-Chalk Mountain			
Eccles Siding to Meadow Valley		See Caliente corridor	
Meadow Valley to Sand Spring Valley		See Caliente corridor	
Sand Spring Valley to Yucca Mountain	1.0	Spring – Reitman's Seep, in eastern Yucca Flat, east of BJ Wye	Y-15, 16
	0.8	Spring – Can Spring, on north side of Skull Mountain on Nevada Test Site	Y-15
Jean		None identified	
Valley Modified		None identified	

a. Source: DIRS 104593-CRWMS M&O (1999, Appendixes E, F, G, H, and I).
b. To convert kilometers to miles, multiply by 0.62137.
c. Some water resources would be avoided by corridor variations. These are identified with a "Y" (yes) and a number representing the specific variation from Table 3-38 that avoids the specific resource. Table 3-38 identifies the variation by number and shows the water resources associated with the corridor segment unique to that variation. The same water resource might be in proximity to both the rail corridor and variation segment. In such cases, the resource is marked "Avoided" for the rail corridor here, but appears on Table 3-38 for the variation.

and industrial, domestic supply, agriculture, etc.)] (DIRS 103406-NDWP 1992, p. 18). These are the areas where additional water demand would be most likely to produce an adverse effect on local groundwater resources. Table 3-39 indicates that none of the corridors would completely avoid Designated Groundwater Basins. However, the Caliente-Chalk Mountain Corridor would cross only two Designated Basins, one at Panaca Valley near the start of the corridor and one at Penoyer Valley where the Caliente and Caliente-Chalk Mountain Corridors split.

The last column of Table 3-39 identifies hydrographic areas that DOE would avoid or cross differently if a corridor variation (also identified in the table) were to be used. In most cases, the variation listed in Table 3-40 would have little or no effect on the hydrographic areas crossed. The Crestline Option, Caliente Option, White River Alternate, Goldfield Alternate, and Stateline Pass Option would involve changing, dropping, or adding a single hydrographic area to those that the rail corridor would cross. The Monitor Valley Option is the only other variation that would make a difference and would result in changing two and adding one to the list of hydrographic areas that the Carlin Corridor would cross.

There are a number of published estimates of perennial yield for many of the hydrographic areas in Nevada, and they often differ from one another by large amounts. This is the reason for listing a range of perennial yield values in Table 3-11 for the hydrographic areas in the Yucca Mountain region. For simplicity, the perennial yield values listed in Table 3-39 generally come from a single source (DIRS 103406-NDWP 1992, Regions 4, 10, 13, and 14) and, therefore, do not show a range of values for each area. The hydrographic areas in the Yucca Mountain region (that is, areas 225 through 230) are the exception to perennial yield values from the single source. The perennial yield values for these areas are from DIRS 147766-Thiel (1999, pp. 6 to 12), which compiles estimates from several sources. The table lists the lowest values in that document.

The perennial yield value shown for Area 227A is the lowest estimated value presented in DIRS 147766-Thiel (1999, p. 8) and is further divided into 300 acre-feet (370,000 cubic meters) for the eastern third of the area and 580 acre-feet (720,000 cubic meters) for the western two-thirds.

Table 3-38. Surface-water-related resources along unique segments of corridor variations.[a,b]

Variation	Applicable corridor(s)[c]	Water resource features: Distance from corridor (kilometers)[d]	Water resource features: Feature
1. Crestline Option	CL/CM	0.3	Spring - Miller Spring south of SR[e] 319 and southeast of Panaca; important water source for game
		1.0	Spring - Miser Spring south of SR 319 and southeast of Panaca
		Within	Riparian area/stream - variation crosses Meadow Valley Wash stream and riparian area south of Panaca
2. Caliente Option	CL/CM	Within	Riparian area/stream - variation crosses Meadow Valley Wash stream and riparian area south of Caliente
		0.6	Spring - unnamed spring in Caliente
		Within	Spring - unnamed spring in Meadow Valley north of Caliente
		0.5	Springs - two unnamed springs in Meadow Valley north of Caliente
3. White River Alternate	CL/CM		None identified - parallels White River further than rail corridor, but not within 1 kilometer
4. Garden Valley Alternate	CL/CM		None identified
5. Mud Lake Alternate	CL/CR		None identified
6. Goldfield Alternate	CL/CR	0.6	Spring - Tognoni Springs northeast of Goldfield
		0.4	Spring - unnamed spring south of Mud Lake and east of U.S. 95
7. Bonnie Claire Alternate	CL/CR		None identified
8. Oasis Valley Alternate	CL/CR	0.5 - 3.0	Springs - numerous springs and seeps along Amargosa River in Oasis Valley
		Within - 0.3	Riparian area/stream - designated area east of Oasis Valley, flowing into Amargosa River, also a riparian area, with persistent water and extensive wet meadows near springs and seeps
		0.8 - 1.8	Springs - group of 13 unnamed springs in Oasis Valley north of Beatty
9. Beatty Wash Alternate	CL/CR		None identified
10. Crescent Valley Alternate	CR		None identified
11. Wood Spring Canyon Alternate	CR		None identified
12. Steiner Creek Alternate	CR	Within	Riparian area - variation crosses designated riparian area in Water Canyon northeast of Bates Mountain
		Within	Riparian/creek - variation crosses Steiner Creek, a designated riparian area. An August 1997 survey found creek dry and lacking riparian vegetation
13. Rye Patch Alternate	CR	0.1	Riparian area - variation parallels riparian area in Rye Patch Canyon
14. Monitor Valley Option	CR	0.7	Spring - unnamed spring east of variation and east of Toquima Range
		0.2	Riparian area - designated riparian area west of variation, northwest of Belmont. An August 1997 survey found area dry and lacking riparian vegetation.
15. Topopah Option	CM	0.6	Spring - Whiterock Spring north of variation, south of Burnt Mountain
15a. Area 4 Alternate	CM		None identified - avoids Whiterock Spring of the Tonopah Option
15b. Mine Mountain Alternate	CM		None identified - main portion of option still passes Whiterock Spring
16. Mercury Highway Option	CM		None identified
17. Pahrump Valley Alternate	J		None identified
18. Stateline Pass Option	J		None identified
19. Valley Connector	VM		None identified
20. Sheep Mountain Alternate	VM		None identified
21. Indian Hills Alternate	VM		None identified

a. Source: DIRS 104593-CRWMS M&O (1999, Appendixes E, F, G, H, and I).
b. Rail corridors are listed in Table 3-37. Water resources identified in that table that can be avoided by a variation are identified with a number designation that is consistent with the numbering in this table.
c. Rail corridor abbreviations used in the table are defined as follows: CL = Caliente; CM = Caliente-Chalk Mountain; CR = Carlin; J = Jean; VM = Valley Modified.
d. To convert kilometers to miles, multiply by 0.62137.
e. SR = State Route.

Table 3-39. Hydrographic areas (groundwater basins) crossed by candidate rail corridors.

Rail corridor	Hydrographic area[a] No.	Hydrographic area[a] Name	Perennial yield (acre-feet)[b,c,d]	Designated Groundwater Basin[e,f]	Avoided by variation (Yes or No)[g]
Caliente					
Eccles Siding to Sand Spring Valley	204	Clover Valley	1,000	No	Y-1, 2
	203	Panaca Valley	9,000	Yes	Y-1, 2
	181	Dry Lake Valley	2,500	No	N
	208	Pahroc Valley	21,000	No	Y-3
	171	Coal Valley	6,000	No	Y-3
	172	Garden Valley	6,000	No	N
Sand Spring Valley to Mud Lake	170	Penoyer Valley (Sand Spring Valley)	4,000	Yes	N
	173A	Railroad Valley, southern part	2,800	No	N
	156	Hot Creek	5,500	No	N
	149	Stone Cabin Valley	2,000	Yes	N
	141	Ralston Valley	6,000	Yes	Y-6
Mud Lake to Yucca Mountain	145	Stonewall Flat	100	No	Y-6
	144	Lida Valley	350	No	N
	146	Sarcobatus Flat	3,000	Yes	N
	228	Oasis Valley	1,000	Yes	N
	229	Crater Flat	220	No	N
	227A	Fortymile Canyon and Jackass Flats	880[h]	No	N
Carlin	54	Crescent Valley	16,000	Yes	N
Beowawe to Austin	138	Grass Valley	13,000	No	N
	137B	Big Smoky Valley, northern part	65,000	Yes	Y-14
Austin to Mud Lake – Via Big Valley	137A	Big Smoky Valley and Tonopah Flat	6,000	Yes	Y-14
	142	Alkali Spring Valley	3,000	No	Y-14
	145 to 227A	See Caliente Corridor			
Mud Lake to Yucca Mountain					
Caliente-Chalk Mountain	204 to 170	See Caliente Corridor			
Eccles Siding to Sand Spring Valley	158A	Emigrant Valley and Groom Lake Valley	2,800	No	N
Sand Spring Valley to Yucca Mountain	159	Yucca Flat	350	No	N
	160	Frenchman Flat	16,000	No	N
	227A	Fortymile Canyon and Jackass Flats	880[h]	No	N
Jean	165	Jean Lake Valley	50	Yes	Y-18
Jean to Yucca Mountain	164A	Ivanpah Valley, northern part	700	Yes	Y-18
	163	Mesquite Valley (Sandy Valley)	2,200	Yes	Y-18
	162	Pahrump Valley	12,000	Yes	N
	230	Amargosa Desert	24,000	Yes	N
	227A	Fortymile Canyon and Jackass Flats	880[h]	No	N
Valley Modified	212	Las Vegas Valley	25,000	Yes	N
Dike Siding (north of Las Vegas) to Yucca Mountain	211	Three Lakes Valley, southern part	5,000	Yes	N
	161	Indian Springs Valley	500	Yes	N
	225	Mercury Valley	250	No	N
	226	Rock Valley	30	No	N
	227A	Fortymile Canyon and Jackass Flats	880[h]	No	N

a. Source: DIRS 101486-Bauer et al. (1996, pp. 542 and 543 with corridor map overlay).

b. Source: DIRS 103406-NDWP (1992, Regions 4, 10, 13, and 14), except hydrographic areas 225 through 230 for which the source is DIRS 147766-Thiel (1999, pp. 6 to 12). The Nevada Division of Water Planning identifies a perennial yield of only 24,000 acre-feet (30 million cubic meters) for the combined area of hydrographic areas 225 through 230.

c. Perennial yield is the estimated quantity of groundwater that can be withdrawn annually from a basin without depleting the reservoir.

d. To convert acre-feet to cubic meters, multiply by 1,233.49.

e. Source: DIRS 148165-NDWP (1999, Regions 4, 10, 13, and 14).

f. "Yes" indicates the State of Nevada considers the area a Designated Groundwater Basin where permitted water rights approach or exceed the estimated perennial yield and the water resources are being depleted or require additional administration, including a State declaration of preferred uses (municipal and industrial, domestic supply, agriculture, etc.). Designated Groundwater Basins are also referred to as Administered Groundwater Basins.

g. Some variations would involve crossing different hydrographic areas than those listed here for the rail corridor. In such cases, the portion of the rail corridor that corresponds to the unique variation segment is identified with a "Y" (yes) and a number representing the variation(s) from Table 3-40. Hydrographic areas in which the unique variation segment begins or ends appear both here, with a "Y," and in Table 3-40 with the applicable variation.

h. The perennial yield value shown for Area 227A is the lowest estimated value presented in DIRS 147766-Thiel (1999, p. 8) and is further broken down into 370,000 cubic meters (300 acre-feet) for the eastern third of the area and 720,000 cubic meters (580 acre-feet) for the western two-thirds.

Table 3-40. Hydrographic areas crossed by unique segments of corridor variations.

Variation	Applicable corridor(s)[a]	Note[b]	Hydrographic area crossed[c] No.	Hydrographic area crossed[c] Name	Perennial yield (acre-feet)[d,e]	Designated Groundwater Basin[d]
1. Crestline Option	CL/CM		197	Escalante Desert	1,000	No
			203	Panaca Valley	9,000	Yes
2. Caliente Option	CL/CM		203	Panaca Valley	9,000	Yes
3. White River Alternate	CL/CM		208	Pahroc Valley	21,000	No
			207	White River Valley	37,000	No
			171	Coal Valley	6,000	No
4. Garden Valley Alternate	CL/CM	(1)	171	Coal Valley	6,000	No
			172	Garden Valley	6,000	No
5. Mud Lake Alternate	CL/CR	(1)	141	Ralston Valley	6,000	Yes
6. Goldfield Alternate	CL/CR		141	Ralston Valley	6,000	Yes
			142	Alkali Spring Valley	3,000	No
			145	Stonewall Flat	100	No
7. Bonnie Claire Alternate	CL/CR	(1)	144	Lida Valley	350	No
			146	Sarcobatus Flat	3,000	Yes
8. Oasis Valley Alternate	CL/CR	(1)	228	Oasis Valley	1,000	Yes
9. Beatty Wash Alternate	CL/CR	(2)	228	Oasis Valley	1,000	Yes
			229	Crater Flat	220	No
10. Crescent Valley Alternate	CR	(1)	54	Crescent Valley	16,000	Yes
11. Wood Spring Canyon Alternate	CR	(1)	54	Crescent Valley	16,000	Yes
12. Steiner Creek Alternate	CR	(1)	138	Grass Valley	13,000	No
13. Rye Patch Alternate	CR	(1)	137B	Big Smoky Valley, north	65,000	Yes
14. Monitor Valley Option	CR		137B	Big Smoky Valley, north	65,000	Yes
			140A	Monitor Valley, north	8,000	No
			140B	Monitor Valley, south	10,000	No
			141	Ralston Valley	6,000	Yes
15. Topopah Option	CM	(2)	159	Yucca Flat	350	No
			160	Frenchman Flat	16,000	No
			227A	Fortymile Canyon, Jackass Flats	880	No
16. Mercury Highway Option	CM	(2)	159	Yucca Flat	350	No
			160	Frenchman Flat	16,000	No
17. Pahrump Valley Alternate	J	(1)	162	Pahrump Valley	12,000	Yes
18. Stateline Pass Option	J		164A	Ivanpah Valley, north	700	Yes
			163	Mesquite Valley (Sandy Valley)	2,200	Yes
19. Valley Connector	VM	(2)	212	Las Vegas Valley	25,000	Yes
20. Sheep Mountain Alternate	VM	(1)	212	Las Vegas Valley	25,000	Yes
21. Indian Hills Alternate	VM	(2)	211	Three Lakes Valley, south	5,000	Yes
			161	Indian Springs Valley	500	Yes

a. Rail corridor abbreviations used in the table are defined as follows: CL = Caliente; CM = Caliente-Chalk Mountain; CR = Carlin; J = Jean; VM = Valley Modified.

b. Notes:
   1. The corresponding portion of the rail corridor passes over the same hydrographic area(s) for approximately the same distance(s).
   2. The corresponding portion of the rail corridor passes over the same hydrographic area(s), but for slightly different distance(s).

c. Source: DIRS 101486-Bauer et al. (1996, pp. 542 and 543 with corridor map overlay).

d. Source: DIRS 103406-NDWP (1992, pp. 21 to 25), except hydrographic areas 225 through 230 for which the source is DIRS 147766-Thiel (1999, pp. 6 to 12).

e. To convert acre-feet to cubic meters, multiply by 1,233.49.

3.2.2.1.4 *Biological Resources and Soils*

3.2.2.1.4.1 Biological Resources. The following sections describe biological resources along each of the candidate rail corridors. These environments include habitat types and springs and riparian areas located in a 400-meter (1,300-foot)-wide corridor along each route. Springs and riparian areas are important because they provide habitat for large numbers of plants, animals, and insects. Unless otherwise noted, this information is from the *Environmental Baseline File for Biological Resources* (DIRS 104593-CRWMS M&O 1999, all).

Caliente. From the beginning of the corridor at Caliente to Mud Lake, the Caliente Corridor crosses Meadow, Dry Lake, Coal, Garden, Sand Spring, Railroad, Reveille, Stone Cabin, and Ralston Valleys. From Mud Lake, the corridor crosses Stonewall and Sarcobatus flats, the upper portion of the Amargosa River, the lower portion of Beatty Wash, and Crater and Jackass Flats. The valleys and flats along the

corridor range in elevation from 900 to 1,800 meters (3,000 to 5,900 feet). The corridor also crosses through passes or foothills of several mountain ranges including the Highland, Seaman, Golden Gate, Worthington, and Kawich mountain ranges at elevations ranging from 1,600 to 1,900 meters (5,200 to 6,200 feet). The Caliente Corridor is in the southern Great Basin from its beginning at Caliente to near Beatty Wash. The land cover types along this portion of the corridor include salt desert scrub (60 percent) and sagebrush (33 percent). South of Beatty Wash, the corridor crosses into the Mojave Desert. Predominant land cover types from Beatty Wash to Yucca Mountain include creosote-bursage (59 percent), Mojave mixed scrub (22 percent), and salt desert scrub (19 percent) (DIRS 104593-CRWMS M&O 1999, p. 3-22). Table 3-41 lists biological resources, including sensitive species, identified in or near the corridor. The following paragraphs describe biological resources in the Caliente Corridor. Unless specifically identified otherwise, the text does not describe resources along the corridor variations (that is, options and alternates).

The only resident threatened or endangered species in the Caliente Corridor is the desert tortoise, which occurs only along the southern end of the corridor from about Beatty Wash to Yucca Mountain (DIRS 103160-Bury and Germano 1994, pp. 57 to 72). This area is not critical habitat for desert tortoises (50 CFR 17.95) and their abundance in this area is low in relation to other areas in the range of the species in Nevada (DIRS 103281-Karl 1981, pp. 76 to 92; DIRS 101914-Rautenstrauch and O'Farrell 1998, pp. 407 to 411). Southwestern willow flycatchers *(Empidonax traillii extimus)*, an endangered species, have been observed in dense stands of riparian vegetation in Lincoln County, but there is no suitable habitat for this species in the corridor (DIRS 152511-Brocoum 2000, pp. A-9 to A-13).

The Railroad Valley springfish (*Crenichthys nevadae*), which is Federally threatened and State protected (Nevada Administrative Code 503.067) occurs in Warm Springs about 3 kilometers (1.9 miles) north of the corridor in Hot Creek Valley (DIRS 103261-FWS 1996, all).

Three other species classified as sensitive by the Bureau of Land Management occur in the corridor. Unnamed subspecies of the Meadow Valley Wash speckled dace (*Rhinichthys osculus* ssp.) and Meadow Valley Wash desert sucker (*Catostomus clarki* ssp. 2) have been found in Meadow Valley Wash north of Caliente. In the Beatty area, the Nevada sanddune beardtongue (*Penstemon arenarius*) has been found on sandy soils 10 kilometers (6 miles) north of Springdale. Though not listed in the table, a number of bats classified as sensitive by the BLM also may occur along the corridor and the southern end of the corridor is in the range of the chuckwalla (*Sauromalus obesis*).

The Caliente Corridor crosses several areas designated as game habitat by the Bureau of Land Management (DIRS 101523-BLM 1994, Maps 9 through 13). The corridor crosses bighorn sheep (*Ovis canadensis*) habitat west of Goldfield near Stonewall Mountain. It also crosses mule deer use areas in or near the Chief/Delamar, Worthington, Quin Canyon, Reveille, and Kawich mountain ranges. The corridor crosses pronghorn antelope (*Antilocapra americana*) habitat in the Railroad/Reveille, Sandspring, Stone Cabin, and Ralston Valleys; Ralston Range; and north of Goldfield. Parts of Meadow Valley Wash north of Caliente are classified as waterfowl and quail habitat, and the corridor crosses another area classified as quail habitat at the north end of the Chief Range.

At least four springs or groups of springs and three streams or riparian areas are within 0.4 kilometer (0.25 mile) of the corridor (DIRS 104593-CRWMS M&O 1999, Appendix E). These might be wetlands or other waters of the United States, as defined in the Clean Water Act, although no formal wetlands delineation has been conducted along the corridor. Black Spring is near the corridor at the north end of the Kawich Range and an unnamed spring is near the corridor at the north end of the North Pahroc Range. A series of springs is in the corridor near the Amargosa River in Oasis Valley. The corridor crosses the Meadow Valley Wash south of Panaca. The corridor also crosses the White River between U.S. 93 and Sand Spring Valley and parallels the river for approximately 10 kilometers (6 miles). An August 1997 survey of that portion of the river found it was mostly dry with some standing water in stock

Table 3-41. Biological resources in or near the Caliente Corridor.[a,b]

Resource	Occurrences[c] In corridor	Occurrences[c] Within 5 km[d]
Caliente rail corridor		
Threatened or endangered species		
Desert tortoise	1	
Railroad Valley springfish		1
Sensitive species or habitat		
Amargosa toad		5
Eastwood milkvetch		1
Fringed myotis		1
Funeral Mountain milkvetch		1
Hawk nesting area		1
Meadow Valley Wash desert sucker	1	
Meadow Valley Wash speckled dace	1	
Needle Mountain milkvetch		3
Nevada Sanddune beardtongue	1	1
Oasis Valley speckled dace		2
Oasis Valley springsnail		1
Game habitat		
Bighorn–year round	1	2
Mule deer–winter use	2	
Mule deer–summer use		1
Mule deer–year round	3	1
Pronghorn–year round	6	
Quail–crucial	1	
Quail-year round	1	
Waterfowl–crucial	1	
Springs or groups of springs	4[e]	24[f]
Riparian areas	3	1
Herd Management Units	8	
Caliente Option[g]		
Sensitive species		
Welch's catseye		1
Springs or groups of springs	1	4[f]
Crestline Option[g]		
Sensitive species		
Needle Mountain milkvetch		3
Game habitat		
Bighorn sheep–crucial		1
Mule deer–crucial		1
White River Alternate[g]		
Sensitive species		
Pygmy rabbit		1
Welch's catseye		1
Garden Valley Alternate[g]		
Sensitive species		
Welch's catseye		1
Goldfield Alternate[g]		
Springs or groups of springs		2[f]

a. Source: DIRS 104593-CRWMS M&O (1999, Appendix E, pp. E-1 to E-12).
b. There are no biological resources unique to the Mud Lake, Bonnie Claire, Oasis Valley, or Beatty Wash Alternates.
c. An occurrence represents a distinct population or habitat. The desert tortoise, for example, might occur within 5 kilometers (3 miles) of the corridor as well as within the corridor but, because it is in the same general habitat, it is listed only once on the table.
d. 5 kilometers = 3 miles.
e. Springs inside or within 400 meters (1,300 feet) of the corridor.
f. Springs 400 to 5,000 meters (1,300 to 16,000 feet) from the corridor.
g. Only resources unique to this alignment variation are listed.

waterholes. The corridor crosses the Amargosa River in the north end of the Oasis Valley, in an area designated as a riparian area by the Bureau of Land Management (DIRS 101523-BLM 1994, Maps 14 and 15). The corridor also crosses a number of *ephemeral* streams that might be classified as waters of the United States under Section 404 of the Clean Water Act. Four of the variations (Crestline Option, Caliente Option, Goldfield Alternate, and Oasis Valley Alternate) along the Caliente Corridor would affect the number of, or distance to, associated water resources. Using the Crestline Option, Caliente Option, or Goldfield Alternate would add one spring within 0.4 kilometer (0.25 mile) of the corridor. The Oasis Alternate is close to the same water resources as the corresponding portion of the rail corridor, but it would be farther away from two groups of springs identified near the Amargosa River.

The Caliente Corridor also crosses eight Bureau of Land Management-designated wild horse or wild horse and burro herd management areas (DIRS 101504-BLM 1979, pp. 2-26 through 2-35; DIRS 101523-BLM 1994, Maps 18 and 19). From the beginning of the corridor to Sand Spring Valley, the corridor passes through herd management areas in the Cedar and Chief Ranges. From Sand Spring Valley to Mud Lake, the corridor crosses the Saulsbury, Reveille, and Stone Cabin herd management areas, and from Mud Lake to Yucca Mountain the route crosses the Goldfield, Stonewall, and Bullfrog herd management areas.

Carlin. The Carlin Corridor crosses Crescent and Grass Valleys, then passes through Big Smoky Valley to Mud Lake. From Mud Lake, the corridor crosses Stonewall and Sarcobatus Flats, the upper portion of the Amargosa River, the lower portion of Beatty Wash, and Crater and Jackass Flats. Elevations along the route range from 900 to 2,200 meters (3,000 to 7,200 feet).

The Carlin Corridor is in the Great Basin from its start in Beowawe to near Beatty Wash. Land cover types along this portion of the corridor are dominated by salt desert scrub (57 percent), sagebrush (28 percent), and greasewood (7 percent). At Beatty Wash, the corridor crosses into the Mojave Desert. Predominant land cover types from Beatty Wash to Yucca Mountain include creosote-bursage (59 percent), Mojave mixed scrub (22 percent), and salt desert scrub (19 percent) (DIRS 104593-CRWMS M&O 1999, p. 3-24). Table 3-42 lists biological resources, including sensitive species, identified in or near the corridor. The following paragraphs describe biological resources in the Carlin Corridor (without options or alternates) unless specifically identified otherwise.

The only resident threatened or endangered species in the Carlin Corridor is the desert tortoise, which occurs only along the southern end of the corridor from about Beatty Wash to Yucca Mountain (DIRS 103160-Bury and Germano 1994, pp. 57 to 72). This area is not critical habitat for desert tortoises (50 CFR 17.95) and their abundance in the region is low (DIRS 103281-Karl 1981, pp. 76 to 92; DIRS 101914-Rautenstrauch and O'Farrell 1998, pp. 407 to 411).

Three other species classified as sensitive by the Bureau of Land Management or as protected by Nevada occur along the Carlin Corridor. A ferruginous hawk (*Buteo regalis*) (also classified as protected by Nevada) nesting area is east of Mount Callaghan. The San Antonio pocket gopher (*Thomomys umbrinus curtatus*) has been found in Big Smoky Valley northwest of the San Antonio Mountains. The Nevada sand dune beardtongue has been found in sandy soils 10 kilometers (6 miles) north of Springdale. A number of bats classified as sensitive by the Bureau of Land Management might occur along the corridor, and the southern end of the corridor is in the range of the chuckwalla.

The Carlin Corridor crosses several areas designated as game habitat by the Bureau of Land Management (DIRS 103077-BLM 1983, Map 3-1; DIRS 101523-BLM 1994, Maps 9 to 13; DIRS 104593-CRWMS M&O 1999, p. 3-25). The corridor crosses an area designated as sage grouse (*Centrocercus urophasianus*) habitat in western Grass Valley and another at the southeast end of Rye Patch Canyon. The corridor enters pronghorn antelope habitat north of U.S. Highway 50 near Rye Patch Canyon, along most of Big Smoky Valley, and from Mud Lake to Stonewall Mountain. The corridor crosses mule deer habitat on the west side of Grass Valley and bighorn sheep habitat east of Goldfield**.**

Three springs, five riparian areas, and one reservoir are within 0.4 kilometer (0.25 mile) of the Carlin corridor (DIRS 104593-CRWMS M&O 1999, Appendix F). These areas might be wetlands or other waters of the United States, as defined by the Clean Water Act, although no formal wetlands delineation has been conducted along the corridor. Rye Patch Spring is on the edge of the corridor at the south end of the Simpson Park Mountains. A series of springs is in the corridor near the Amargosa River in Oasis Valley. Seyler Reservoir is less than 0.3 kilometer (0.2 mile) from the corridor in the south end of Big Smoky Valley. Three of the riparian areas (Skull and Ox Corral Creeks, and Rye Patch Canyon) are along the section of the route between Beowawe and Austin at the south end of Grass Valley. Ox Corral Creek, at the south end of Grass Valley, is ephemeral and has little or no riparian vegetation where the route crosses it. The corridor crosses the Amargosa River in the north end of the Oasis Valley, in an area designated as a riparian area by the Bureau of Land Management. This corridor also crosses a number of ephemeral streams that might be classified as waters of the United States under Section 404 of the Clean Water Act. Five of the variations (Oasis Valley Alternate, Steiner Creek Alternate, Rye Patch Alternate, Monitor Valley Option, and Goldfield Alternate) would affect the number of, or distance to Carlin Corridor water resources. Changes associated with the Oasis Valley and Goldfield Alternates were covered above in the Caliente Corridor discussion. The Rye Patch Alternate would involve no changes to water resources identified in, or within 0.4 kilometer of the rail corridor, but would parallel the riparian area in Rye Patch Canyon rather than cross it. The Steiner Creek Alternate would avoid two riparian areas, but another two would be within this variation. The Monitor Valley Option would represent a major change in the corridor, but with respect to water resources within 0.4 kilometer, it would avoid only Seyler Reservoir and would add a designated riparian area northwest of Belmont in its stead.

Table 3-42. Biological resources in or near the Carlin Corridor.[a,b]

Resource	Occurrences[c] In corridor	Occurrences[c] Within 5 km[d]
Carlin rail corridor		
Threatened or endangered species		
Desert tortoise	1	
Sensitive species		
Amargosa toad		5
Big Smoky Valley speckled dace		1
Crescent Dune aegialian scarab		1
Eastwood milkvetch		1
Ferruginous hawk (nesting area)	1	2
Fringed myotis		1
Funeral Mountain milkvetch		1
Nevada Sanddune beardtongue	1	1
Oasis Valley speckled dace		2
Oasis Valley springsnail		1
Pygmy rabbit		1
San Antonio pocket gopher	1	
Game habitat		
Bighorn–year round	1	2
Mule deer–spring	1	3
Mule deer–summer		3
Mule deer–winter		2
Mule deer–year round		3
Pronghorn–summer	1	
Pronghorn–year round	2	
Sage grouse nesting area		1
Sage grouse strutting ground	2	3
Waterfowl		
Springs or groups of springs	3[e]	60[f]
Riparian areas	5	7
Herd Management Units	6	
Wood Spring Canyon Alternate[g]		
Game habitat		
Mule deer–summer		1
Steiner Creek Alternate[g]		
Springs or groups of springs		3[f]
Riparian areas	2	
Rye Patch Alternate[g]		
Springs or groups of springs		1[f]
Monitor Valley Option[g]		
Sensitive species		
Eastwood milkvetch		1
Pygmy rabbit		1
Speckled dace		1
Game habitat		
Elk	1	
Mule deer–spring	1	
Mule deer–winter		3
Pronghorn–winter	1	
Pronghorn–year round	1	
Sage grouse	2	5
Sage grouse–nesting	1	2
Sage grouse–strutting	1	1
Springs or groups of springs		19[f]
Riparian areas	1	5
Herd Management Units	2	
Goldfield Alternate[g]		
Springs or groups of springs	1	1[e]

a. Source: DIRS 104593-CRWMS M&O (1999, Appendix F, pp. F-1 to F-16).
b. There are no biological resources unique to the Crescent Valley, Mud Lake, Bonnie Claire, Oasis Valley, or Beatty Wash Alternates.
c. An occurrence represents a distinct population or habitat. The desert tortoise, for example, might occur within 5 kilometers (3 miles) of the corridor as well as within the corridor but, because it is in the same general habitat, it is listed only once on the table.
d. 5 kilometers = 3 miles.
e. Springs inside or within 400 meters (1,300 feet) of the corridor.
f. Springs 400 to 5,000 meters (1,300 to 16,000 feet) from the corridor.
g. Only resources unique to this alignment variation are listed.

The corridor crosses two wild horse or wild horse and burro herd management areas between Beowawe and Austin (Mount Callaghan and Bald Mountain), one in Big Smoky Valley (Hickison) and three between Mud Lake and Yucca Mountain (Goldfield, Stonewall, and Bullfrog) (DIRS 103077-BLM 1983, Map 2-4; DIRS 101523-BLM 1994, Maps 18 and 19).

Caliente-Chalk Mountain. The Caliente-Chalk Mountain Corridor begins near Caliente and is identical to the Caliente Corridor from Caliente to Sand Spring Valley, crossing Meadow, Dry Lake, Coal, and Garden Valleys at elevations ranging from 1,400 to 1,600 meters (4,600 to 5,200 feet). This portion of the corridor also crosses through passes or foothills of the Highland, Seaman, Golden Gate, and Worthington mountain ranges at elevations of 1,500 to 1,800 meters (4,900 to 5,900 feet). After splitting from the Caliente Corridor, the Caliente-Chalk Mountain Corridor proceeds south through Sand Spring and Emigrant Valleys, over Groom Pass, and through Yucca and Jackass Flats to Yucca Mountain. The elevation along this portion of the route ranges from approximately 1,100 to 1,700 meters (3,600 to 5,600 feet).

Predominant land cover types between Caliente and Sand Spring Valley include sagebrush (50 percent) and salt desert scrub (47 percent). The vegetation along the route from Sand Spring Valley to Yucca Flat is typical of the southern portion of the Great Basin. From Yucca Flat to Yucca Mountain, the corridor passes through a zone of transition between the Mojave and Great Basin deserts. The predominant land cover types from Sand Spring Valley to the Yucca Mountain site are blackbrush (50 percent), salt desert

scrub (31 percent), and sagebrush (9 percent). Table 3-43 lists biological resources, including sensitive species, identified in or near the corridor. The following paragraphs describe biological resources in the Caliente-Chalk Mountain Corridor (without variations) unless specifically identified otherwise.

Table 3-43. Biological resources in or near the Caliente-Chalk Mountain Corridor.[a,b]

Resource	Occurrences[c] In corridor	Occurrences[c] Within 5 km[d]
Caliente-Chalk Mountain rail corridor		
Threatened or endangered species		
Desert tortoise		
Sensitive species		
Beatley's scorpionweed		17
Funeral Mountain milkvetch		1
Hawk nesting area		1
Largeflower suncup	1	18
Long-legged myotis		1
Meadow Valley Wash desert sucker	1	
Meadow Valley Wash speckled dace	1	
Needle Mountain milkvetch		3
Oasis Valley springsnail		1
Ripley's springparsley	1	1
Game habitat		
Mule deer–winter	1	
Mule deer–summer		1
Mule deer–year round	2	
Pronghorn–year round	1	
Quail–crucial	1	
Quail–year round	1	
Waterfowl–crucial	1	
Springs or groups of springs	1[e]	14[f]
Riparian areas	2	
Herd Management Units	2	
Mercury Highway Option[g]		
Sensitive species		
Hilend's bedstraw		2
Largeflower suncup		2
Ripley's springparsley	2	6
Springs or groups of springs		2[f]
Topopah Option[g]		
Sensitive species		
Clokey's egg milkvetch		2
Hilend's bedstraw		3
Paiute beardtongue		4
Ripley's springparsley		2
Springs or groups of springs		3[f]
Mine Mountain Alternate[g]		
Sensitive species		
Funeral Mountain milkvetch		4
Largeflower suncup		2
Paiute beardtongue		2
Springs or groups of springs		1[f]

a. Source: DIRS 104593-CRWMS M&O (1999, Appendix G, pp. G-1 to G-9).
b. There are no biological resources unique to the Area 4 Alternate. Biological resources for the Crestline and Caliente Options can be found in Table 3-41 for the Caliente Corridor.
c. An occurrence represents a distinct population or habitat. The desert tortoise, for example, might occur within 5 kilometers (3 miles) of the corridor as well as within the corridor but, because it is in the same general habitat, it is listed only once on the table.
d. 5 kilometers = 3 miles.
e. Springs inside or within 400 meters (1,300 feet) of the corridor.
f. Only resources unique to this alignment variation are listed.

The only resident threatened or endangered species in the Caliente-Chalk Mountain Corridor is the desert tortoise, which occurs on the Nevada Test Site south of Yucca Flat. This area is not critical habitat for desert tortoises (50 CFR 17.95) and their abundance is low (DIRS 101914-Rautenstrauch and O'Farrell 1998, pp. 407 to 411). Southwestern willow flycatchers, an endangered species, have been observed in dense stands of riparian vegetation in Lincoln County, but there is no suitable habitat for this species in the corridor (DIRS 152511-Brocoum 2000, pp. A-9 to A-13).

Four species classified as sensitive by the Bureau of Land Management have been found in the corridor. Unnamed subspecies of the Meadow Valley Wash speckled dace and Meadow Valley Wash desert sucker have been found in Meadow Valley Wash. Ripley's springparsley (*Cymopterus ripleyi* var. *saniculoides*) has been reported between Sand Spring Valley and Yucca Mountain in Yucca Flat. The largeflower suncup (*Camissonia megalantha*) has been found in the corridor at three locations in Yucca Flat. Bats classified as sensitive by the Bureau of Land Management also may occur near the corridor. Chuckwalla may occur in suitable habitat on the Nevada Test Site.

The Caliente-Chalk Mountain Corridor crosses several areas designated as game habitat by the Bureau of Land Management (DIRS 101504-BLM 1979, pp. 2-26 through 2-35; DIRS 101523-BLM 1994, Maps 9, 10, and 11). The corridor crosses mule deer use areas in or near the Chief and Delamar ranges, Worthington and Quinn Canyon ranges and north of Groom Pass. The corridor crosses pronghorn habitat in Sand Spring and Emigrant Valleys. Parts of Meadow Valley north of Caliente are classified as

waterfowl and quail habitat and the corridor crosses another area classified as quail habitat at the north end of the Chief Range.

At least one spring or group of springs and two streams occur within 0.4 kilometer (0.25 mile) of the corridor. These areas might be classified as wetlands or other waters of the United States (DIRS 104593-CRWMS M&O 1999, p. 3-27), as defined in the Clean Water Act, although no formal wetlands delineation has been conducted. An unnamed spring is near the corridor at the north end of the North Pahroc Range. The corridor crosses Meadow Valley Wash south of Panaca. The corridor crosses the White River between U.S. 93 and Sand Spring Valley and parallels the river for approximately 10 kilometers (6 miles). An August 1997 survey of that portion of the river found it was mostly dry with some standing water in stock waterholes. This corridor also crosses a number of ephemeral streams or washes that might be classified as waters of the United States. Two of the variations (Crestline Option and Caliente Option) would affect the number of or distance to, water resources within a 0.4 kilometer (0.25 mile) of the Caliente-Chalk Mountain Corridor. Changes in the list of nearby water resources for both of these options were covered above in the Caliente Corridor discussion.

The Caliente-Chalk Mountain Corridor passes through two wild horse or wild horse and burro herd management areas (DIRS 101504-BLM 1979, pp. 2-42 and 2-43; DIRS 101523-BLM 1994, Maps 18 and 19) in the Cedar Mountains south of Panaca and in the Chief Range west of Panaca.

Jean. The Jean Corridor starts in Ivanpah Valley north of Jean and proceeds west of Wilson Pass to the Pahrump Valley. The corridor continues to the Yucca Mountain site through Pahrump Valley and across the Amargosa Desert and Jackass Flats. This corridor is in the Mojave Desert, with elevations ranging from about 850 to 1,500 meters (2,800 to 4,900 feet).

The predominant land cover types in the corridor are creosote-bursage (59 percent), Mojave mixed scrub (21 percent), and blackbrush (18 percent) (DIRS 104593-CRWMS M&O 1999, p. 3-28). Table 3-44 lists the biological resources, including sensitive species, identified in or near the corridor. The following paragraphs describe biological resources in the Jean Corridor (without alternates) unless specifically identified otherwise.

The only resident threatened or endangered species in the Jean Corridor is the desert tortoise. The entire corridor is in the range of this species (DIRS 103160-Bury and Germano 1994, pp. 57 to 72). Along most of the corridor, especially the western portions from Pahrump to Yucca Mountain, the abundance of desert tortoises is low (DIRS 101840-Karl 1980, pp. 75 to 87; DIRS 101914-Rautenstrauch and O'Farrell 1998, pp. 407 to 411). However, some areas crossed by the corridor in Ivanpah, Goodsprings, Mesquite, and Pahrump Valleys have a higher abundance of tortoises (DIRS 101521-BLM 1992, Map 3-13). The corridor does not cross areas classified as critical habitat for desert tortoises (50 CFR 17.95).

One location of each of two subspecies of the pinto beardtongue (*Penstemon bicolor bicolor* and *P.b. roseus)*, which is classified as sensitive by the Bureau of Land Management, is in the first 5 kilometers (3 miles) of the corridor near Jean. No other Bureau of Land Management sensitive species have been documented in the corridor, although chuckwalla, gila monsters (*Heloderma suspectus cinctum*), and a number of bat species classified as sensitive probably occur there in suitable habitat.

The Jean Corridor crosses several areas the Bureau of Land Management designates as game habitat (DIRS 103079-BLM 1998, Maps 3-7, 3-8, and 3-9). The corridor crosses chukar habitat north of Goodsprings, and quail habitat northwest of Wilson Pass, east of Pahrump, and northwest of Johnnie. The corridor crosses mule deer winter habitat around Wilson Pass and north of Pahrump. The southern edge of bighorn sheep winter range is crossed in the southern Bird Spring Mountains and crucial bighorn habitat is crossed around Wilson Pass. The corridor also crosses a bighorn sheep migration route between the Bird Springs and Spring Mountains and a potential migration corridor from winter range in the Devils Hole Hills to historic but currently unoccupied habitat at the west end of the Spring Mountains.

Table 3-44. Biological resources in or near the Jean Corridor.[a,b]

Resource	Occurrences[c] In corridor	Occurrences[c] Within 5 km[d]
Jean rail corridor		
Threatened or endangered species		
Desert tortoise	1	
Sensitive species		
Allen's big-eared bat		1
Death Valley beardtongue		3
Desert bearpoppy		3
Fringed myotis		1
Gila monster		1
Long-legged myotis		1
Oasis Valley springsnail		1
Pinto beardtongue	2	18
Redheaded sphecid wasp		1
Sheep fleabane		1
Spring Mountain milkvetch		2
Townsend's big-eared bat		1
White-margined beardtongue		5
Wolly sage		1
Yuma myotis		1
Game habitat		
Bighorn sheep–crucial	1	1
Bighorn sheep–migration corridor	2	
Bighorn sheep–winter	1	7
Chukar–crucial	1	
Mule deer–summer crucial		2
Mule deer–winter	2	2
Quail–crucial	3	4
Springs or groups of springs		11[e]
Herd Management Units	3	
Stateline Pass Option[f]		
Sensitive species		
White-margined beardtongue		1
Pinto beardtongue		1
Desert bearpoppy		7
Rusby's globemallow		1
Pahrump Valley buckwheat		3
Game habitat		
Bighorn sheep–winter	1	
Quail–crucial		2

a. Source: DIRS 104593-CRWMS M&O (1999, Appendix H, pp. H-1 to H-9).
b. There are no biological resources unique to the North Pahrump Valley Alternate.
c. An occurrence represents a distinct population or habitat. The desert tortoise, for example, might occur within 5 kilometers (3 miles) of the corridor as well as within the corridor but, because it is in the same general habitat, it is listed only once on the table.
d. 5 kilometers = 3 miles.
e. Springs 400 to 5,000 meters (1,300 to 16,000 feet) from the corridor.
f. Only resources unique to this alignment variation are listed.

There are no springs, perennial streams, or riparian areas within 0.4 kilometer (0.25 mile) of this corridor or its variations. The corridor crosses a number of ephemeral washes that might be classified as waters of the United States under Section 404 of the Clean Water Act.

There are three wild horse and burro herd management areas in the corridor (DIRS 103079-BLM 1998, Map 2-1). The Red Rock herd management area is southeast of the Spring Mountains and the Wheeler Pass and Johnnie herd management areas are west of the Spring Mountains.

Valley Modified. The Valley Modified Corridor begins in the northeastern corner of the Las Vegas Valley, crosses the northern edge of the valley south of the Las Vegas Range, and continues northwest toward Indian Springs. The route continues across the southern portion of Three Lakes and Indian Springs Valleys to the Nevada Test Site and passes through Mercury Valley, Rock Valley, and Jackass Flats to the Yucca Mountain site. The corridor ranges in elevation from approximately 700 to 1,100 meters (2,300 to 3,600 feet).

This route is in the Mojave Desert and the predominant land cover types are creosote-bursage (79 percent) and Mojave mixed scrub (16 percent; DIRS 104593-CRWMS M&O 1999, p. 3-29). Table 3-45 lists biological resources, including sensitive species, identified in or near the corridor. The following paragraphs describe biological resources in the Valley Modified Corridor (without alternatives) unless specifically identified otherwise.

The only resident threatened or endangered species in the Valley Modified Corridor is the desert tortoise. The entire corridor is in the range of this species (DIRS 103160-Bury and Germano 1994, pp. 57 to 72). In general, the abundance of tortoises along this corridor through Las Vegas Valley, Indian Springs Valley, and the Nevada Test Site is low (DIRS 101521-BLM 1992, Map 3-13; DIRS 101914-Rautenstrauch and O'Farrell 1998, pp. 407 to 411). This corridor does not cross areas classified as critical habitat for desert tortoises (50 CFR 17.95). The razorback sucker (*Xyrauchen texanus*), classified as threatened under the

Table 3-45. Biological resources in or near the Valley Modified Corridor.[a,b]

Resource	Occurrences[c] In corridor	Occurrences[c] Within 5 km[d]
Valley Modified rail corridor		
Threatened or endangered species		
Desert tortoise	1	
Pahrump poolfish		2
Razorback sucker		1
Sensitive species		
Beatley's scorpionweed		1
California bearpoppy		17
Death Valley beardtongue		2
Desert bearpoppy		11
Largeflower suncup		3
Mojave milkvetch		1
Parish's scorpionweed	3	6
Pinto beardtongue		2
Ripley's springparsley	1	1
Townsend's big-eared bat		1
White-margined beardtongue		1
Game habitat		
Bighorn sheep–crucial		1
Bighorn sheep–winter		3
Mule deer–winter		1
Quail–crucial		2
Springs or groups of springs		3[e]
Indian Hills Alternate[f]		
Sensitive species		
Desert bearpoppy		1
Mojave milkvetch		4
Herd Management Units	1	

a. Source: DIRS 104593-CRWMS M&O (1999, Appendix I, pp. I-1 to I-6).
b. There are no biological resources unique to the Sheep Mountain Alternate or Valley Connector.
c. An occurrence represents a distinct population or habitat. The desert tortoise, for example, might occur within 5 kilometers (3 miles) of the corridor as well as within the corridor but, because it is in the same general habitat, it is listed only once on the table.
d. 5 kilometers = 3 miles.
e. Springs 400 to 5,000 meters (1,300 to 16,000 feet) from the corridor.
f. Only resources unique to this alignment variation are listed.

Endangered Species Act and as protected under Nevada Administrative Code, have been introduced into ponds at Floyd Lamb State Park, 4.2 kilometers (2.6 miles) south of the corridor (DIRS 104593-CRWMS M&O 1999, p. 3-29). Refuge populations of the Pahrump poolfish (*Empetrichthys latos latos*), classified as endangered under the Endangered Species Act and Nevada Administrative Code, have been introduced into ponds in Floyd Lamb State Park and into the outflow of Corn Creek Springs, 4.5 kilometers (2.8 miles) northeast of the corridor (DIRS 104593-CRWMS M&O 1999, p. 3-29).

Two other species classified as sensitive by the Bureau of Land Management occur in the corridor. Three populations of Parish's scorpionweed (*Phacelia parishii*) and a population of Ripley's springparsley have been reported on the Nevada Test Site in Rock Valley. No other Bureau of Land Management sensitive species have been documented in the corridor, although chuckwalla, gila monsters, and a number of bat species probably occur there in suitable habitat.

There are no herd management areas, Areas of Critical Environmental Concern, or designated game habitat in the Valley Modified Corridor (DIRS 104593-CRWMS M&O 1999, p. 3-29; DIRS 103079-BLM 1998, Maps 3-7, 3-8, and 3-9). No springs or riparian areas occur within 0.4 kilometer (0.25 mile) of this rail corridor or its variations. This corridor crosses a number of ephemeral streams or washes that might be classified as waters of the United States under Section 404 of the Clean Water Act.

3.2.2.1.4.2 Soils. Soil surveys have been performed and documented throughout much of the United States, including portions of Nevada, by the U.S. Department of Agriculture. Further, the Department of Agriculture has undertaken several efforts to compile this soil survey data into computerized databases for use by government agencies and the general public. One of these databases, the State Soil Geographic database, was developed by generalizing more detailed soil survey data; its purpose is to support planning on the State and multicounty level (DIRS 154246-USDA 1994, pp. 1 and 2). The Yucca Mountain

Project has queried the database for information on soils along the rail corridors. Though the database presents generalized, or higher level information, it still contains massive amounts of data, much more than can be presented in this EIS. However, DOE selected several soil characteristics with potential for environmental impact implications for presentation here to indicate the types of soil along the corridors. One of the database elements selected was soil areas designated as prime farmland. Prime farmlands are

defined as lands that have the best combination of physical and chemical characteristics needed to economically produce sustained high-yield agricultural crops [7 CFR 657.5(a)]. Based on the query of the State Soil Geographic database, there are no soils classified as prime farmlands in the rail corridors, including the option and alternate segments (DIRS 155600-Sorensen 2001, p. 2).

DOE also queried the database for other codes representing soil attributes that could be of concern from an environmental perspective and that would need to be considered during the design and construction of a new branch rail line. The query was made by overlaying the rail corridor locations on the soil units in the database and the result was the identification, by corridor segment, of whether the identified attribute might be present in the area in or around the segment. The selected soil attributes in this query are termed "shrink swell," "erodes easily," "unstable fill," and "blowing soil." Each of these attributes not only represents potential environmental and construction concerns, but is associated with physical characteristics of soil. The following paragraphs describe these attributes.

The *shrink swell* attribute is a gauge of how much the volume of a soil changes when it is wet compared to when it is dry. In the State Soil Geographic database, any soil that swells less than 3 percent when wet is considered to have "low" limitations with respect to its use in construction; 3 to 6 percent is considered to present "moderate" limitations and greater than 6 percent has "high" limitations [DIRS 155602-USDA 2001, Part 620.05(a)(2) and Table 620-2]. Querying the database for the shrink swell code identifies (but does not distinguish) soils with moderate or high limitations. The purpose of these limitations is not to indicate that construction cannot or should not be performed in such soils, but rather that the design and construction plans need to account for that soil characteristic. A soil's potential for volume change with loss or gain of moisture varies with the amount and type of clay minerals it contains. In general, more clay in the soil indicates a greater volume change.

The *erodes easily* attribute is a measure of the susceptibility of bare soil to be detached and moved by water. It is based on a factor (designated as "K") used in the commonly employed Universal Soil Loss Equation [DIRS 155602-USDA 2001, Part 620.04 and 620.06(f)(9)]. Measurements on standardized plots are used to determine experimentally values for K, which range from 0.02 to 0.64. Other factors in the equation being equal, a higher K value indicates more susceptibility to erosion by water. The main properties affecting this attribute are soil texture, organic material structure, and permeability. In general, clay soils have low K values because they are resistant to detachment, and sandy soils have low values because they have high infiltration rates (reduced runoff) and particles that erode are not easily transported. Silt loam soils have moderate to high K values. Silt soils have the highest values because they readily form crusts that promote runoff and the particles are easily detached and transported (DIRS 155601-USDA 2001, all). Querying the database for the *erodes easily* code identifies soils with K values greater than 0.35. These are soils with fair to poor erosion characteristics when disturbed and that probably contain relatively high amounts of loams and silts.

The *unstable fill* attribute is a measure of a soil's tendency to move when it is wet or loaded, or both. Stable soils are generally not subject to mass movement under these conditions, and moderately stable soils can involve mass movement when a moderate disturbance provides the initiating action. In unstable soils, slight disturbances can result in mass movement when soil is wet or loaded [DIRS 155602-USDA 2001, Part 620.12(a)(1) and Table 620-37]. Soils identified in the database with the *unstable fill* code are those likely to be moderately stable or unstable when used as fill.

The *blowing soil* attribute is based on groupings used during soil surveys to classify the susceptibility of soil to wind erosion. This classification method uses eight groupings. Soils assigned to group 1 are the most susceptible to wind erosion and those assigned to group 8 are the least susceptible. Descriptions of soils in the groupings range from sands to coarse fragments not susceptible to wind erosion (DIRS 155602-USDA 2001, Part 618.72 and Exhibit 618-16). Querying the database for the blowing soil code

identifies soils with wind erodibility groups of 1 or 2 [DIRS 155602-USDA 2001, Part 620.06(f)(9) and Table 620-11]. The definitions of these two groups are as follows:

- Group 1 - Coarse sands, sands, fine sands, and very fine sands
- Group 2 - Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material and sapric (fine, decomposed, organic muck) soil material

The blowing soil attribute identifies areas where fine textured, sandy materials probably predominate and where uncontrolled soil disturbance could result in increased wind erosion.

The following paragraphs discuss the results of the State Soil Geographic database query for the four identified soil attributes by rail corridor. In general terms, the corridors that approach Yucca Mountain from the north (that is, the Caliente, Carlin, and Caliente-Chalk Mountain Corridors) encounter relatively high percentages of soils with *shrink swell, erodes easily,* and *blowing soil* characteristics. The corridors that approach Yucca Mountain from the south (that is, the Jean and Valley Modified Corridors) encounter relatively high percentages of soils with only two of those characteristics (that is, *shrink swell* and *blowing soil*). None of the corridors would have high percentages of *unstable fill*, though such soil is present in about 10 percent of the Jean Corridor. The corridor-specific soil information presented in the following paragraphs does not represent detailed soil survey data, but does provide insight into the soil characteristics and potential environmental aspects that would have to be considered during the engineering and design of a branch rail line. Should a decision be made to select one of the rail corridors for transportation of materials to Yucca Mountain, DOE would perform soil surveys of the selected corridor to collect detailed information on the environmental and engineering characteristics of the soils that would be encountered.

Caliente Corridor. Table 3-46 lists the percentage of the Caliente Corridor that crosses soils with the four attributes described in this section. The percentage is the portion of the corridor in which the identified soil attribute could present a concern or limitation for the construction of a rail line. The *shrink swell, erodes easily,* and *blowing soils* attributes are prevalent along this corridor. Soils with shrink swell and erodes easily attributes are common throughout most of the northern two-thirds of Nevada with more scattered presence in the southern third (DIRS 155600-Sorensen 2001, pp. 15 and 16). The *blowing soil* attribute is associated with soils scattered heavily throughout the State (DIRS 155600-Sorensen 2001, p. 18). The corridor crosses no soil areas identified with the *unstable fill* attribute. As indicated in the table, the use of any of the alternate or option segments would change the portion of the corridor with any of the identified soil attributes by no more than 3 percent.

Table 3-46. Percentage of the Caliente Corridor with selected soil attributes.[a]

Description	Percentage of corridor with identified soil attribute			
	Shrink swell	Erodes easily	Unstable fill	Blowing soil
Caliente Corridor	61	69	0	81
Change with any other alternate/option	± 3	± 3	± 0	± 1

a. Source: DIRS 155600-Sorensen (2001, pp. 4 to 14).

Carlin Corridor. Table 3-47 lists the percentage of the Carlin Corridor that crosses soils with the four attributes described in this section. The *shrink swell, erodes easily,* and *blowing soils* attributes are prevalent along this corridor. Soils with *shrink swell* and *erodes easily* attributes are common throughout most of the northern two-thirds of Nevada with more scattered presence in the southern third (DIRS 155600-Sorensen 2001, p. 15 and 16). The *blowing soil* attribute is associated with soils scattered throughout the State (DIRS 155600-Sorensen 2001, p. 18). The Carlin Corridor would cross no soil areas identified with the *unstable fill* attribute. If the Monitor Valley option was used, the soil attribute percentages would change little with the exception of the *shrink swell* attribute, which would increase by

Table 3-47. Percentage of the Carlin Corridor with selected soil attributes.[a]

Description	Percentage of corridor with identified soil attribute			
	Shrink swell	Erodes easily	Unstable fill	Blowing soil
Carlin Corridor	56	69	0	88
With Monitor Valley Option	76	69	0	84
Change with any other alternate/option	± 2	± 3	± 0	± 1

a. Source: DIRS 155600-Sorensen (2001, pp. 4 to 14).

about 20 percent. As indicated in the table, the use of any of the other alternate or option segments would change the portion of the corridor with any of the identified soil attributes by no more than 3 percent.

Caliente-Chalk Mountain. Table 3-48 presents the percentage of the Caliente-Chalk Mountain rail corridor that would cross soils with the four attributes described in this section. As can be seen in the table, the *shrink swell, erodes easily,* and *blowing soils* attributes are prevalent along this rail corridor as they are for the other two corridors that would approach the site from the north. Soils with *shrink swell* and *erodes easily* attributes are common throughout most of the northern two-thirds of Nevada with more scattered presence in the southern third (DIRS 155600-Sorensen 2001, pp. 15 and 16). The *blowing soil* attribute is associated with soils scattered heavily throughout the state (DIRS 155600-Sorensen 2001, p. 18). The Caliente-Chalk Mountain rail corridor would cross no soil areas identified with the *unstable fill* attribute. As shown in the table, use of any one of the other alternate or option segments would change the portion of the corridor with any of the identified soil attributes by no more than 4 percent.

Table 3-48. Percentage of the Caliente-Chalk Mountain rail corridor with selected soil attributes.[a]

Description	Percentage of corridor with identified soil attribute			
	Shrink swell	Erodes easily	Unstable fill	Blowing soil
Caliente-Chalk Mountain rail corridor	52	75	0	86
Change with any single alternate/option	± 4	± 3	± 0	± 2

a. Source: DIRS 155600-Sorensen (2001, pp. 4 to 14).

Jean Corridor. Table 3-49 lists the percentage of the Jean Corridor that would cross soils with the four attributes described in this section. The *shrink swell* and *blowing soils* attributes are prevalent along this corridor even though these soils occur only in scattered locations in southern Nevada (DIRS 155600-Sorensen 2001, pp. 16 and 18). A small amount of this corridor passes through soil areas with *erodes easily* and *unstable fill* attributes. As indicated in the table, if DOE used the Stateline Pass Alternate, the percentage of the corridor crossing soils with *erodes easily* and *blowing soil* attributes would increase about 10 percent for either attribute. Use of the Pahrump Alternate would result in little or no change in the corridor's soil attributes.

Table 3-49. Percentage of the Jean Corridor with selected soil attributes.[a]

Description	Percentage of corridor with identified soil attribute			
	Shrink swell	Erodes easily	Unstable fill	Blowing soil
Jean Corridor	89	11	10	77
With Pahrump Valley Alternate	89	11	10	78
With the Stateline Pass Alternate	92	19	11	91

a. Source: DIRS 155600-Sorensen (2001, pp. 4 to 14).

Valley Modified Corridor. Table 3-50 lists the percentage of the Valley Modified Corridor that crosses soils with the four attributes described in this section. The *shrink swell* and *blowing soils* attributes are prevalent along this corridor, even though these soils occur only in scattered locations in southern Nevada (DIRS 155600-Sorensen 2001, pp. 16 and 18). This corridor would not pass through any significant amount of soil area with *erodes easily* and *unstable fill* attributes. As indicated in the table, if DOE used

Table 3-50. Percentage of the Valley Modified rail corridor with selected soil attributes.[a]

Description	Percentage of corridor with identified soil attribute			
	Shrink swell	Erodes easily	Unstable fill	Blowing soil
Valley Modified Corridor	76	0	0	76
With the Indian Hills Alternate	92	0	0	92
Change with any other alternate	± 1	± 0.2	± 0.2	± 1

a. Source: DIRS 155600-Sorensen (2001, pp. 4 to 14).

the Indian Hills Alternate, the percentage of the corridor crossing soils with *shrink swell* and *blowing soil* attributes would increase about 16 percent for either attribute. Use of either of the other two alternates (Valley Connector or Sheep Mountain) would result in little change in the corridor's soil attributes.

3.2.2.1.5 *Cultural Resources*

The baseline environmental conditions presented in this section focus on the archaeological and historic resources associated with the candidate rail corridors. This section also discusses Native American interests in relation to two of the corridors. Unless otherwise noted, this information is from the *Environmental Baseline File for Archaeological Resources* (DIRS 104997-CRWMS M&O 1999, all). In addition, information from the *American Indian Perspectives on the Yucca Mountain Site Characterization Project and the Repository Environmental Impact Statement* (DIRS 102043-AIWS 1998, all) and *Additional Baseline Cultural Resources Data for the Nevada Transportation Scenario* (DIRS 155826-Nickens and Hartwell 2001, all) were used.

Archaeological and Historic Resources. Based on a records search at the Desert Research Institute in Las Vegas and Reno, the Harry Reid Center at the University of Nevada, Las Vegas, and the Bureau of Land Management Battle Mountain and Elko Offices, archaeological surveys have been conducted in less than 1 percent of the total areas for the Caliente, Jean, and Valley Modified Corridors, less than 3 percent of the total area for the Carlin Corridor, and less than 5 percent of the total area for the Caliente-Chalk Mountain Corridor. The record searches examined each candidate rail corridor, including the variations. Although it is possible to identify areas in a corridor that are most likely to contain cultural resources based on such factors as general land forms and proximity to water, these predictions are highly uncertain prior to corridor selection and the completion of intensive field studies and, therefore, are not included in this EIS.

Initially, archaeological site file searches were completed for larger rail corridors, ranging between 1.6 and 8 kilometers (1 and 5 miles) in total width. More than 2,300 archaeological and historic sites were documented for these wider corridors. The wider corridors used in the initial records searches included all corridor variations. As project plans become more detailed, it was possible to reduce the potential corridor width to a 0.2-kilometer (0.1-mile)-wide buffer zone on either side of the centerline. Records indicate that a number of archaeological sites have been identified along the reduced corridors and that some of these sites are recorded as potentially eligible for nomination to the *National Register of Historic Places*. Table 3-51 summarizes this information. The table also lists potentially eligible sites by type. For conservatism, this group includes sites not yet evaluated for eligibility. The sites recorded but not included in the potentially eligible group represent sites that had no recommendations about eligibility to the National Register.

DOE is implementing the stipulations and forms of a Programmatic Agreement (DIRS 104558-DOE 1988, all) with the Advisory Council on Historic Preservation to address DOE's responsibilities under Sections 106 and 110 of the National Historical Preservation Act and the Council's implementing regulations. Although not a formal signatory to the Agreement, the Nevada State Historic Preservation Officer has the right at any time, upon request, to participate in monitoring DOE compliance with the Programmatic Agreement. In addition, DOE provides annual reports to the Advisory Council on Historic

Table 3-51. Number of previously recorded archaeological sites along candidate rail corridors including variations [based on corridor width of 0.4 kilometer (0.25 mile)].

Category[a]	Caliente	Carlin	Caliente-Chalk Mountain	Jean	Valley Modified
Potentially eligible for nomination					
Temporary camps	--[b]	--	3	--	--
Extractive localities	--	--	3	--	--
Processing localities	--	--	--	--	--
Localities	--	1	16	--	--
Caches	--	--	--	--	--
Stations	--	--	--	--	--
Historic sites	--	--	3	--	--
Unknown type	7	20	3	--	7
Total potentially eligible	*7*	*21*	*28*	*0*	*7*
Not evaluated	29	26	6	2	4
Recorded sites (approximate total)	*97*	*110*	*100*	*6*	*19*

a. Section 3.1.6 contains the definitions of site types for potentially eligible for nomination sites (temporary camps, extractive localities, etc.).
b. -- = none identified.

Preservation and the Nevada State Historic Preservation Officer describing the activities conducted by DOE each year to implement the stipulations of the Programmatic Agreement. This report includes a description of DOE coordinations and consultations with Federal and State agencies and Native American tribes concerning historic and culturally significant properties at Yucca Mountain.

DOE will continue to seek input from the Nevada State Historic Preservation Officer and the Advisory Council on Historic Preservation, and will interact appropriately to meet the reporting and other stipulations of the existing Programmatic Agreement. Because the 1988 Programmatic Agreement primarily covers site characterization activities at the Yucca Mountain site, DOE would negotiate a new programmatic agreement to cover cultural resources requirements for any selected Nevada transportation corridor.

Records and literature reviews reveal the presence of numerous historic properties and districts that one or more of the candidate rail corridors could affect, depending on the route selected. A number of these are linear features that a given corridor would intersect. Table 3-52 lists the more important of these linear properties.

In addition to the linear historic properties, the candidate rail corridors are close to several other historic properties, many of which are already listed on either the *Nevada State Register of Historic Places* or the *National Register of Historic Places*, or are currently unevaluated. Table 3-53 lists the more important properties.

Other potentially important historic properties that could be within rail corridors include elements of many historic mining districts, several historic ranches (especially Crescent, Grass, Big Smoky, and Monitor Valleys), and the World War II Tonopah Army Air Field bombing range. Numerous Cold War-era resources that have been documented at the Nevada Test Site could be affected (for example, Camp Desert Rock).

Native American Interests. Through the American Indian Writers Subgroup of the Consolidated Group of Tribes and Organizations, Native Americans have noted that, while transportation issues are of extreme interest to them, at present they cannot provide specific comments on any of the Nevada transportation project alternatives (DIRS 102043-AIWS 1998, pp. 4-4 to 4-6) due to the absence of systematic ethnographic studies for any of the proposed project areas.

Table 3-52. Historic period linear cultural resource properties intersected by potential rail corridors and variations.[a]

Property	Rail corridor-variation	National Historic Trail Designation Status[b]
California Emigrant Trail (1840s)	Carlin	Designated *California National Historic Trail.* Segment is designated Low Potential.[c]
Western Pacific Railroad (1907)	Carlin	
Salt Lake to San Francisco Transcontinental Airways Route (1920-1940s) and Parran to Beowawe Cutoff (1928-1929)	Carlin	
Jedidiah Smith Exploration Route (1827)	Carlin - Monitor Valley Option	
John C. Fremont Military Reconnaissance Route (1845-1846)	Carlin - Big Smoky Valley Option	
James Simpson Federal Wagon Road Route Survey (1859)	Carlin and Monitor Valley Options	
Pony Express Trail (1861)	Carlin and Rye Patch Alternates and Monitor Valley Option	Designated *Pony Express National Trail.* Segment is designated High Potential.[c]
Pacific Telegraph Line (1861)	Carlin and Rye Patch Alternate	
Butterfield Overland Mail & Stage Route (1861)	Carlin and Rye Patch Alternate	
Lincoln Highway (1920s)	Carlin and Rye Patch Alternates and Monitor Valley Option	
Tonopah-Goldfield Railroad (1903-1947)	Carlin/Caliente	
Las Vegas and Tonopah Railroad (1905-1918)	Carlin/Caliente Valley Modified and Indian Hills and Sheep Mountain Alternates	
Jayhawker's Emigrant Trail (1849)	Caliente/Caliente-Chalk Mountain	
Old Spanish Trail (1830); later the Mormon Road (after 1850)	Jean and Stateline Pass Option	Under evaluation for designation by Congress as a National Historic Trail
Yellow Pine Mining Company railroad (1911-1934)	Jean	
Las Vegas to Bullfrog Stage Road (1904-1906)	Carlin Valley Modified - Indian Hills Alternate	
Caliente and Pioche Railroad (1907)	Caliente and Caliente and Crestline Options	

a. Source: DIRS 155826-Nickens and Hartwell (2001, pp. 15 and 20 to 25).
b. Those properties showing no status entries are neither designated by Congress as National Historic Trails nor under evaluation for such a status.
c. Trail segments are evaluated for their potential to afford a high-quality recreation experience in a portion of the route having greater than average scenic values or affording an opportunity to vicariously share the experience of the original users of the trail. Evaluations shown here apply to the trail segment intersected by the applicable rail corridor.

Table 3-53. Cultural resource properties close to proposed rail corridors and listed on State or National Registers of historic places.[a]

Property	Rail corridor	Status
Tonopah Multiple Resource Area	Carlin/Caliente	NRHP
Belmont Historic District	Carlin – Monitor Valley Option	NSRHP, NRHP
Goldfield Historic District	Carlin/Caliente and Goldfield Alternates	NRHP
Union Pacific Depot, Caliente	Caliente	NRHP
Smith (Scott) Hotel, Caliente	Caliente	NSRHP
Sedan Crater Area 10, Nevada Test Site	Caliente-Chalk Mountain	NRHP
Goodsprings Mining District	Jean	NSRHP
Tule Springs Archaeological Site	Valley Modified	NSRHP, NRHP
Corn Creek Campsite	Valley Modified	NRHP
Tule Springs Ranch District	Valley Modified	NRHP

a. Source: DIRS 155826-Nickens and Hartwell (2001, Table 6, pp. 17-19).
b. NRHP = *National Register of Historic Places*; NSRHP = *Nevada State Register of Historic Places.*

General concerns for potential transportation-related impacts raised by Native Americans include the following:

- Radioactive and hazardous waste transportation could have an adverse impact along rail or highway routes near existing or planned Native American communities, people, businesses, and resources.
- All of the proposed routes being considered pass through the traditional holy lands of the Southern Paiute, Western Shoshone, and Owens Valley Paiute and Shoshone peoples.
- Many of these routes correspond or are adjacent to ancient pathways and complex trail systems known to and used by Native American peoples.
- The Consolidated Group of Tribes and Organizations is aware of important culturally sensitive areas, traditional use areas, sacred sites, and other important resources that fall in the proposed transportation project areas, and will present this information when appropriate in the development of the Nevada transportation system.

These general concerns apply to the proposed rail corridors discussed in this section, and the proposed heavy-haul truck route alternatives and intermodal transfer station locations discussed in Section 3.2.2.2.5.

There are three known historic period Native American cemeteries, two in Crescent Valley and one to the south in Grass Valley. One of the Crescent Valley cemeteries is still in use and is about 1.6 kilometers (1 mile) east of the corridor; the other smaller, early historic cemetery is possibly located within the corridor. The Native American cemetery in Grass Valley might also be located within the corridor. In addition, Western Shoshone families use several hot springs in Crescent Valley for ceremonies. Archaeological investigations in Grass Valley have documented the presence of several historic period Western Shoshone villages, many near ranches that employed Native Americans. For example, at the Grass Valley Ranch, which the Carlin route passes, there are six known villages, several of which might be in the Carlin corridor. Late 19th- and 20th-century Native American villages and homes found in association with Euro-American ranches could occur in many of the valleys that the rail corridors pass through. The same might be true at several mining districts that attracted Native Americans with employment opportunities.

Recent Native American field studies (DIRS 156932-AIET 2000, all) have demonstrated the importance of the Wild Horse and Willow Springs areas, which occur on Nellis Air Force Range and Bureau of Land Management lands east of the Town of Goldfield. The combined Carlin-Caliente Corridor passes to the

east of the two springs; the Goldfield Alternate passes to the west. The Goldfield Alternate is the closest to either spring, being about 1.2 kilometers (0.7 mile) west of Willow Springs (DIRS 104593-CRWMS M&O 1999, Appendix E, p. E-10).

Native American communities are present near at least two of the candidate rail corridors:

- *Jean.* The Pahrump Paiute Tribe is a non-Federally recognized tribe without a land base. The tribe consists of about 100 Southern Paiute people living in the Pahrump area (see Section 3.1.6.2). Individual members of the tribe live as close as 5 kilometers (3 miles) to the Jean Corridor.

- *Valley Modified.* The Las Vegas Paiute Tribe is a Federally recognized tribe consisting of about 100 people living on two separate tribal parcels in southern Nevada. One parcel near downtown Las Vegas consists of about 73,000 square meters (18 acres) of land with 21 homes, tribal administrative offices, and various tribal businesses. This parcel is about 11 kilometers (7 miles) from the route of the Valley Modified Corridor. The other parcel is in the northwest part of the Las Vegas Valley along U.S. 95. It consists of 16 million square meters (4,000 acres) with 12 homes and various business enterprises. This parcel is about 1.6 kilometers (1 mile) from the Valley Modified Corridor.

Congress has assigned trust lands to the Timbisha Shoshone that would directly involve the Carlin and Caliente Corridors. This is the Timbisha Shoshone Tribe Homeland effort, part of which transfers 11 square kilometers (2,800 acres) of Bureau of Land Management land at Scottys Junction to the Secretary of the Interior to hold in trust for the Tribe. This area is within the Tribe's former homeland and several tribal families lived there. The Tribe plans to use this tract for single-family residences and small-scale economic development (DIRS 154121-DOI 2000, Volume I, p. 19). The Bonnie Claire Alternate of both the Carlin and Caliente Corridors passes directly through the tract transferred to the Timbisha Shoshone Tribe.

In addition, private Native American land holdings could be affected along the Carlin corridor. Western Shoshone families own ranches in Crescent Valley, and several allotments were made to Western Shoshone individuals by the U.S. Government from 1919 to 1925 under provisions of the Dawes Allotment Act of 1887. Several of these allotments were in Big Smoky Valley and Monitor Valley.

3.2.2.1.6 *Socioeconomics*

Section 3.1.7 describes the socioeconomic backgrounds of the three counties (Clark, Lincoln, and Nye) most involved in the corridors. The Carlin corridor includes other counties—Esmeralda, Eureka, and Lander—in addition to Nye County. This section contains baseline socioeconomic information for Eureka, Esmeralda, and Lander Counties.

Socioeconomic effects from the construction of a rail line would be small and, for the most part, short-term. Therefore, the socioeconomic information for Esmeralda, Eureka, and Lander Counties is less detailed than the information for the counties in the repository site region of influence in Section 3.1.7.

Population. Section 3.1.7.1 contains population data on Clark, Lincoln, and Nye Counties. This section provides population background for the other counties potentially affected by the Carlin Corridor (Esmeralda, Eureka, and Lander).

The population of Esmeralda County is 100 percent rural. The 1990 Census population for the county was about 1,300 persons. The 2000 population density of the county is somewhat less than 0.3 person per square mile. The estimated Esmeralda County population in 2000 was about 970 (DIRS 155872-Bureau of the Census 2000, County Totals).

The population of Eureka County is 100 percent rural. The 1990 Census population of the county was about 1,500. The estimated population of Eureka County in 2000 was about 1,650 (DIRS 155872-Bureau of the Census 2000, County Totals). The 2000 population density was about 0.4 person per square mile.

The population of Lander County is rural, with a small urbanized population concentrated entirely in Battle Mountain. The 1990 Census population of the county was about 6,300 persons. The estimated population of Lander County in 2000 was about 7,100 (DIRS 155872-Bureau of the Census 2000, County Totals). The county had a 2000 population density of about 1.2 persons per square mile.

Employment. Section 3.1.7.2 contains employment and economic information on Clark, Nye, and Lincoln Counties. Portions of the potential Carlin rail route pass through Esmeralda, Eureka, and Lander Counties. In 2000, Esmeralda, Eureka, and Lander Counties had average labor forces of about 470, 850, and 2,320, respectively, and average unemployment rates of 10.0, 2.6, and 7.7 percent (DIRS 155818-NDETR 2001, all). In 1997, the per capita income of Esmeralda, Eureka, and Lander Counties was about $19,200, $22,000, and $21,000, respectively (DIRS 153928-NDA 2000, all). All three of these counties are small in economic terms.

Housing. Section 3.1.7.4 contains housing data on Clark, Lincoln, and Nye Counties. Esmeralda, Eureka, and Lander Counties are all rural areas. The housing stock of Esmeralda County in 1990 was about 1,000 units, of which about 590 were occupied (DIRS 148097-Bureau of the Census 1998, Esmeralda). There were about 830 units in 2000 (DIRS 155872-Bureau of the Census 2000, all). The housing stock of Eureka County in 1990 was about 820 units, of which about 620 were occupied (DIRS 148097-Bureau of the Census 1998, Eureka). In 2000, there were about 1,000 units (DIRS 155872-Bureau of the Census 2000, Eureka). The housing stock of Lander County in 1990 was about 2,600 housing units, of which about 2,200 were occupied (DIRS 148097-Bureau of the Census 1998, Lander). In 2000, there were about 2,800 units (DIRS 155872-Bureau of the Census 2000, Lander).

Economy. Section 3.1.7.2 contains employment and economic information on Clark, Lincoln, and Nye Counties. Esmeralda, Eureka, and Lander are very small counties in economic terms. Eureka and Esmeralda Counties derive most of their economic activity from the accommodations and food service industry. Lander County's largest industries are in the retail and wholesale sectors. Like Lincoln County, Esmeralda and Lander have lower per capita incomes than other Nevada counties and chronically high unemployment.

Public Services. Section 3.1.7.5 contains information on public services in Clark, Lincoln, and Nye Counties. Esmeralda, Eureka, and Lander Counties are rural areas. County sheriff departments serve Eureka, Esmeralda, and Lander Counties. During the 2000-2001 school term, the Eureka County school district served 305 students, the Lander County district enrolled 1,449 (847 kindergarten through grade 6 and 602 secondary students), and the Esmeralda County school district served 107 students in kindergarten through grade 8. High-school aged students from Esmeralda attended school in Tonopah (Nye County) (DIRS 155820-NDE 2001, "Nevada School Enrollment 2000-2001"). In 1998, Esmeralda had no practicing doctors or dentists, Eureka had a single practicing physician but no dentists, and Lander County had three doctors and two dentists (DIRS 153928-NDA 2000, all).

3.2.2.1.7 *Noise and Vibration*

Most of the proposed rail corridors pass through unpopulated desert with average day-night background sound levels of 22 to 38 A-weighted decibels (dBA). (A-weighted decibels are explained in Section 3.1.9.1.) However, each candidate corridor passes near small rural communities (see Chapter 6, Figures 6-15 through 6-19). Noise levels in rural communities usually range from 40 to 55 dBA. DOE used computerized mapping programs to examine proposed transportation corridors for the presence and proximity to routes that could be designated for the transfer of nuclear material to the Yucca Mountain

site. The process involved the examination of computerized maps at very high detail to determine the extent of road grids in communities and major road intersections. The analysis estimated the distance from the proposed rail corridor and the community to determine if the community was in the region of influence for rail transportation.

Caliente. Most of the Caliente Corridor passes through undeveloped Bureau of Land Management land where background noise levels range from 22 to 38 dBA (Table 3-32), influenced primarily by wind. Noise levels of 40 to 55 dBA are present in the rural communities along the corridor including Beatty, Goldfield, Panaca, and Caliente (Table 3-32).

Carlin. The Carlin Corridor, from its origin at Beowawe to its terminus at Yucca Mountain, including the Monitor Valley option and other options south of Tonopah, traverses mostly unpopulated desert. The only town within 1.6 kilometers (1 mile) of the corridor is Hadley at the southern end of Big Smoky Valley (Monitor Valley option). Noise levels of 40 to 55 dBA are present in rural communities near the corridor, including Beatty, Goldfield, Tonopah, Austin, and smaller communities between Tonopah and Battle Mountain (Table 3-32). Occasional noise from military aircraft overflights occurs near the Nellis Air Force Range.

Caliente-Chalk Mountain. Almost half of the 345-kilometer (214-mile) Caliente-Chalk Mountain Corridor is on Nellis Air Force Range or Nevada Test Site land; the remainder is on Bureau on Land Management land. Noise levels of 40 to 55 dBA are present in rural communities along the corridor including Panaca and Caliente (Table 3-32). Occasional noise from military aircraft overflights occurs near and in the Nellis Air Force Range.

Jean. The Jean Corridor, with the Stateline option, passes through Bureau of Land Management land and a small section of private land. A large portion of this proposed corridor passes through unpopulated desert. Noise levels of 40 to 55 dBA are present in small communities along the corridor including Amargosa Valley, Goodsprings, Pahrump, and Jean (Table 3-32). Occasional noise from military aircraft overflights occurs near and in the Nellis Air Force Range.

Valley Modified. The Valley Modified Corridor, and its various options, begins in the northeast end of the Las Vegas Valley, travels west across Nellis Air Force Base and the southern end of the Desert National Wildlife Range, and then closely parallels U.S. 95 to the vicinity of Mercury (a government installation). Noise levels along stretches of unpopulated desert should range from 22 to 38 dBA, which are typical for a desert environment during calm and windy days (DIRS 101531-Brown-Buntin 1997, p. 7). The corridor would pass 3 kilometers (2 miles) north of Floyd R. Lamb State Park and less than 5 kilometers (3 miles) south of Corn Creek Station, which is part of the Desert National Wildlife Range managed by the Fish and Wildlife Service. Noise levels at the state park and at Corn Creek would probably be only slightly higher than those in an unpopulated desert environment. Noise levels in the northern Las Vegas Valley can be as high as 60 dBA (Table 3-32). Noise levels in Indian Springs, Cactus Springs, and Mercury probably range from 40 to 55 dBA (Table 3-32). Occasional noise from military aircraft overflights occurs near and in the Nellis Air Force Range.

Ground Vibration. Railroad construction and the operation of trains transporting materials and nuclear waste in casks have been proposed for several candidate rail corridors. These corridors have been planned to avoid human residences and communities to the extent possible. As a consequence, background levels of ground vibration lack human influence and are small; that is, most likely less than 50 VdB (velocity decibels, a measure of vibration amplitude).

3.2.2.1.8 *Aesthetics*

To assist in the management of public lands under its control, the Bureau of Land Management established land management guidelines based on the visual resources of an area. Visual resources include the natural and manmade physical features that give a particular landscape its character and value as an environmental factor. There are four visual resource classes. Classes I and II are the more highly valued. Class III is moderately valued, and Class IV is of least value. The majority of land in the potential rail corridors is under the jurisdiction of the Bureau of Land Management. The following paragraphs contain aesthetic baseline information for each of the rail corridors. Visual resource classifications described for the rail corridors were obtained from published Bureau of Land Management documents or through conversations with Bureau of Land Management personnel. Scenic quality classifications for lands that would be crossed on the Nevada Test Site were generated by DOE using Bureau of Land Management guidelines. Section 3.1.10 contains more information on the Bureau of Land Management visual resource classes and scenic quality classes. Unless otherwise noted, this information is from the *Environmental Baseline File: Aesthetics* (DIRS 105002-CRWMS M&O 1999, all).

Caliente. Section 3.2.2.1.4 describes the environmental setting along the Caliente Corridor. The corridor passes through the Caliente, Schell, Tonopah, and Las Vegas Bureau of Land Management resource areas. The corridor crosses mostly Class IV lands, crosses Class III land near Caliente, and crosses or skirts the edges of Class II lands near Caliente and in the Seaman, Reveille and Kawich ranges, the Golden Gate Hills, and the Worthington Mountains. Lands crossed on the Nevada Test Site have scenic quality ratings of Class B or C (Figure 3-31).

Carlin. Section 3.2.2.1.4 describes the environmental setting of the Carlin corridor. The corridor passes through four Bureau of Land Management resource areas (Elko, Shoshone-Eureka, Tonopah, and Las Vegas). The route is on Class IV land from its beginning to the Nevada Test Site border. Lands crossed on the Nevada Test Site have scenic quality ratings of Class B or C (Figure 3-31).

Caliente-Chalk Mountain. Section 3.2.2.1.4 describes the environmental setting of the Caliente-Chalk Mountain Corridor. The corridor passes through the Caliente and Schell Bureau of Land Management resource areas. The route begins on Class III land east of Caliente, and crosses mostly Class IV land to the border of the Nevada Test Site (Figure 3-31). On the Nevada Test Site the corridor passes through lands with scenic quality Class B or C.

Jean. Section 3.2.2.1.4 describes the environmental setting of the Jean Corridor. The corridor crosses the Las Vegas and the Northern and Eastern Mojave Bureau of Land Management resource areas. The Wilson Pass Option of the corridor passes through Class II land in Goodsprings Valley and the Spring Mountains, but the rest of the route to the west and the Stateline Pass Option cross Class III land. Approximately 10 kilometers (6 miles) of the route crosses lands in California; that area does not have Visual Resource Management class ratings. Lands crossed on the Nevada Test Site have scenic quality ratings of Class B or C (Figure 3-31).

Valley Modified. Section 3.2.2.1.4 describes the environmental setting of the Valley Modified Corridor. The corridor crosses the Las Vegas Bureau of Land Management resource area. The entire route to the boundary of the Nevada Test Site crosses Class III land. Lands on the Nevada Test Site have scenic quality ratings of Class B or C (Figure 3-31).

Section 3.2.2.1.1 contains additional information on current land use. Based on these descriptions, all of the candidate rail corridors have been affected to some extent by man. Based on a field survey by DOE, these impacts can be seen from the potential corridors and in detail from the adjacent mountains.

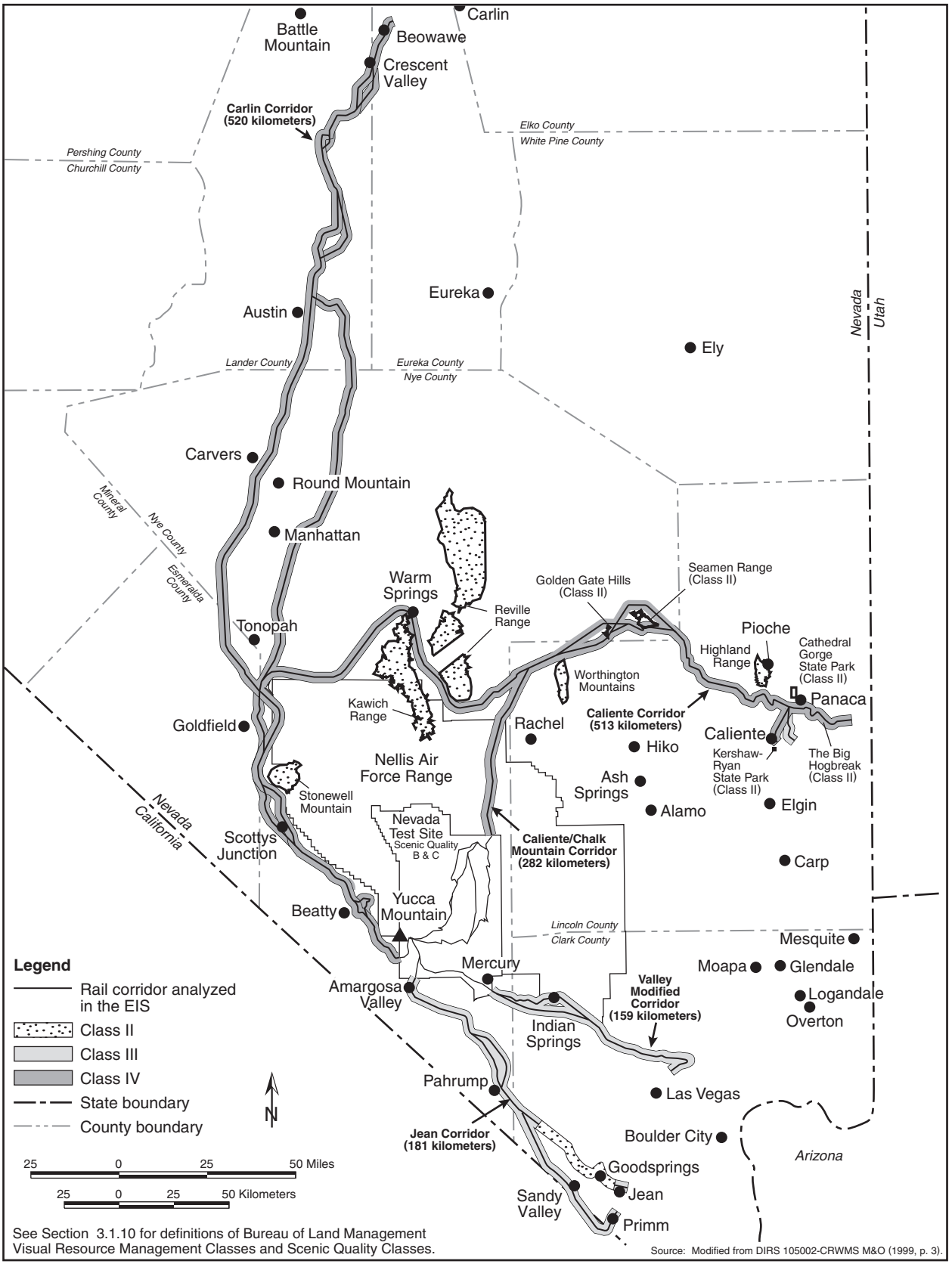


Figure 3-31. Visual Resource Management classes along the potential rail corridors.

3.2.2.1.9 *Utilities, Energy, and Materials*

All five primary rail corridors pass through typically remote Nevada countryside but are within the southern Nevada supply chain for the commodities required during construction and operation. Electric power, which would be available to a limited extent at nearby communities or other locations near power lines, probably would not be needed.

3.2.2.1.10 *Environmental Justice*

The five candidate rail corridors would not appreciably affect counties other than those through which they pass. Section 3.1.13 contains information on the minority and low-income communities in the three counties most involved in the corridors (Clark, Lincoln, and Nye) and includes Figures 3-27 and 3-28, which show locations of minority and low-income communities, respectively, in Nevada. Figures 3-29 and 3-30 provide similar information, at a higher resolution, for the Las Vegas metropolitan area in Clark County. The Carlin corridor is the only route that passes through other counties (Esmeralda, Eureka, and Lander, in addition to Nye). This section contains baseline information on minority and low-income communities in Esmeralda, Eureka, and Lander Counties, in addition to the information shown in Figures 3-27 and 3-28. Unless otherwise noted, the *Environmental Baseline File for Environmental Justice* (DIRS 105004-CRWMS M&O 1999, all) is the basis for the information in this section. DOE has updated and refined information germane to the environmental justice analysis since the Publication of the Draft EIS, including an additional and more detailed mapping of minority populations (see Appendix J, Section J.3.1.2). Although 2000 Census data concerning minority communities in Nevada were available at the Census block level in time for the Final EIS analysis, 2000 Census data on low-income communities were not. Therefore, the information on low-income communities is from the most current available source, the 1990 Census.

In 2000, the minority population (White Hispanic, Black, Asian/Pacific Islander, American Indian/ Eskimo/Aleut, and Other) of Esmeralda County was about 190, or 20 percent of the population (DIRS 156909-Bureau of the Census 2001, p. 6 of Table DP-1; Esmeralda County). In 1990, there were about 210 persons living in poverty, or 15 percent of the population. No block group in Esmeralda County exceeded the threshold for identification as a low-income community (DIRS 103134-Bureau of the Census 1992, Table P117). (Section 3.1.13 defines minority and low-income communities.)

In 2000, the minority population of Eureka County was about 250 persons, or 15 percent (DIRS 156909-Bureau of the Census 2001, p. 7 of Table DP-1; Eureka County). In 1990, there were about 160 persons living in poverty, or 10 percent of the population. No block group in Eureka County exceeded the threshold for identification as a low-income community (DIRS 103141-Bureau of the Census 1992, Table P117).

In 2000, the minority population of Lander County was about 1,400 persons, or 24 percent (DIRS 156909-Bureau of the Census 2001, p. 9 of Table DP-1; Lander County). In 1990, there were about 670 persons living in poverty, or 11 percent of the population. No block group in Lander County exceeded the threshold for identification as a low-income community (DIRS 103144-Bureau of the Census 1992, Table P117).

Some detail on the affected environment for environmental justice that was presented in the Draft EIS for rail corridors has been deleted because of a change in the nature and level of available information. Because of the differences in the level of data between the minority and low-income categories, a combined, parallel discussion is no longer appropriate. The baseline presentation of information now relies on the Section 3.1.13 figures referenced above to identify locations of minority and low-income communities in proximity to the candidate rail corridors.